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BUILDING A LINE OF INQUIRY AROUND INSTRUCTIONAL PROGRAM COHERENCE: THE ROLE OF COHERENCE IN TEACHER WELL-BEING, TURNOVER INTENTIONS, AND MENTAL MODELS

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DEDICATION

For my husband, Mark Fiegener, who is my greatest inspiration in life.

For my parents, Brian and April Gilbert, whose belief in me has been the foundation upon which I have stood.

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Soli Deo Gloria.

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Abstract

Previous studies suggest that instructional program coherence is related to higher student achievement and school improvement. There is little known about the process by which coherence operates in schools, specifically how it may create conditions in the instructional environment that enable teachers to thrive. The purpose of this three-study dissertation is to examine the relationship between instructional program coherence and measures of teacher well-being – namely, psychological need satisfaction and turnover. The first study tests the relationship between instructional program coherence and teacher psychological need satisfaction. The second study 1) examines the relationship between instructional program coherence and teacher intent to leave; and 2) tests teacher psychological need satisfaction as a mediating variable in the relationship between instructional program coherence and teacher intent to leave. Thus far, instructional program coherence has been conceptualized and measured as the alignment of structures (i.e., curriculum, assessments, professional development) within the instructional environment. A sole focus on structural coherence, however, neglects the role of human cognition in influencing teacher action and behavior. Mental models are the cognitive frameworks that guide action. The third study expands the work of coherence by conceptualizing a cognitive dimension of instructional coherence. Cognitive instructional coherence is defined as the sharedness of teacher mental models of a common instructional framework. A set of items are advanced to capture cognitive instructional coherence, and construct validity is tested through the assessment of content validity, structural validity, and convergent validity.

INTRODUCTION

Jen graduated at the top of her class from a reputable 4-year teacher preparation program and accepted an elementary teaching position at a well-respected school district after receiving multiple job offers. After completing the district new teacher orientation, she entered the classroom with confidence and enthusiasm. After a few short weeks, however, Jen faced unexpected challenges. As she began sifting through district-enforced curricula, assessments, and standards, she found conflicting messages and expectations.

As Jen recalls, the school handed teachers a book and said, "Teach it this way from this book," but would give them another book that said something different. Curricula, she found, did not fit the standards they were required to teach, nor did they match the assessments mandated by the school and the state. District report cards were still aligned to Common Core standards while the state had enacted new standards three years previously. In reference to the multiple programs adopted by the school, Jen says, "Nothing is connected or integrated, so everything feels like a separate load because it is all isolated." She suggests that if content and resources were connected, it would alleviate teacher stress.

The district does have an instructional framework, but she remembers it being discussed only at the new teacher orientation, and she refers to it as "just another load" since the follow-up has been scarce. Jen found little continuity among classrooms; teachers use different assessments, and even if they do use the same tools, they interpret the data differently. The school offers ample professional development opportunities, but the topics covered are not related to subsequent sessions, leaving teachers to see the topics as isolated parts and, therefore, each a separate load. "They think things can be covered in one PD day," says Jen. The school offers book study options that focus on student discipline. Teachers choose from three books,

each of which focuses on a different discipline program. Jen says of the various discipline programs, “I think these would work well together if we could bring them together and teach actual skills to teachers.” Instead, each program uses different language and approaches.

Jen’s experience, as described above, represents an incoherent instructional environment that places a burden on teachers and inhibits their ability to make sense of their roles as instructors (Newmann, Smith, Allensworth, & Bryk, 2001; Honig & Hatch, 2004). Jen experienced feelings of burnout and psychological stress as she tried to make sense of a chaotic instructional environment. At the end of the school year, Jen’s stress and frustration led her to reevaluate her plans to return to her school the following year. Ultimately, she decided to stay, citing her involvement in outside mentoring opportunities as a primary motivator in her decision. Jen’s account is not an isolated case but rather represents the experiences of many new and seasoned teachers alike, not only in how an incoherent instructional environment can be a source of frustration and burnout for teachers but also in how these negative psychological states may lead to teachers’ reconsideration of their career choices.

Jen’s dilemma of whether or not to return to the classroom is one that many Oklahoma teachers currently face. A record number of Oklahoma teachers have left their schools in recent years, and the number continues to climb. In the last six years, more than 30,000 teachers have left the profession entirely, an average of about 5,000 teachers per year (Oklahoma State Department of Education, 2018). “Movers” (teachers who leave their schools or positions for new ones) and “leavers” (teachers who leave the profession) combine for an average turnover rate of 23.6 percent (Oklahoma State Department of Education, 2018). As a result, Oklahoma faces a teacher shortage crisis that continues to worsen. In response to the shortage, policy has focused efforts on the recruitment of teachers through programs such as Teach for America and

by granting of a record number of emergency teacher certifications. In the 2018-19 school year, nearly 3,000 emergency certifications were approved, compared to just 32 in 2012 (Oklahoma State Department of Education, 2018). Also in process is legislation that allocates significant funding for the recruitment of new teachers to Oklahoma schools.

These actions, although they may initially strengthen the teacher corps in number, have fallen short in addressing the chronic teacher shortage since the crisis is not only an issue of recruitment but also one of retention (Ingersoll, 2003; Oklahoma State Department of Education, 2018). In Oklahoma, teachers recruited through Teach For America as well as those emergency certified are among those most likely to leave the profession (Oklahoma State Department of Education, 2018). Thus, it seems that schools have become a "revolving door," as those who are recruited through these programs rapidly cycle in and out of their schools at high rates (Ingersoll, 2003). In 2018, teachers received the first pay raise in a decade, following a historic state-wide teacher walkout. Despite salary increases, however, Oklahoma still faces an exodus of teachers and continues to grant a record number of emergency certifications to fill the voids in classrooms (Oklahoma State Department of Education, 2019). In a survey of teachers who hold Oklahoma teaching certificates but no longer teach, two thirds of respondents reported that a raise in teacher pay alone would not be sufficient to motivate their return to the profession (Oklahoma State Department of Education, 2018).

These examples suggest that although policy at the state level plays a critical role in finding solutions, it is insufficient for addressing the complex issues that define the teacher shortage (Ingersoll, 2003). While local school officials may tend to look to state policymakers for solutions, teacher turnover is a phenomenon that varies across districts and even schools, suggesting that schools play an active and proximal role in retaining teachers (Ingersoll, 2001).

In fact, the literature on teacher turnover points to school working conditions as the primary predictors of teacher attrition, even when controlling for both salary and student demographics (Allensworth, Ponisciak, & Mazzeo, 2009; Boyd, Grossman, Ing, Lankford, Loeb, & Wyckoff, 2011; Carver-Thomas & Darling-Hammond, 2017; Guin, 2004; Ingersoll, 2003; Johnson, Kraft, & Papay, 2012; Ladd, 2011; Loeb, Darling-Hammond, & Luczak, 2005; Smith & Ingersoll, 2004; Weiss, 1999). Ingersoll (2002) describes the teacher shortage as a "bucket rapidly losing water because of holes in the bottom" (p. 42). Recruiting more teachers will do little to solve the teacher shortage until these "holes," the working conditions of schools, are addressed (Ingersoll, 2002). This claim seems relevant to the teacher shortage in Oklahoma; eighty percent of Oklahoma teachers report that the working conditions in their schools have deteriorated since they began teaching and as recent recruits are the ones leaving the profession at the highest rates (Oklahoma State Department of Education, 2018). While there are many working conditions related to teacher well-being and teacher retention, this dissertation explores one working condition, instructional program coherence, arguing that it serves as a potential support for teacher psychological needs and motivation for teachers to stay in their schools.

Previous evidence has established that the degree to which employee basic psychological needs are satisfied has consequences on employee performance, satisfaction, well-being, and retention (Boudrias et al., 2014; Fernet, Austin, & Vallerand, 2012; Ford, Olsen, Khojasteh, Ware, & Urick, 2019; Ryan & Deci, 2017; Van den Broeck, Vansteenkiste, De Witte, & Lens, 2008). Specifically in the context of teaching, psychological need satisfaction has been shown to predict teacher attrition (Ford et al., 2019). Self-Determination Theory credits the social environment, and in this case, the social-organizational work environment, as having the ability to either support or diminish these basic psychological needs for autonomy, competence, and

relatedness (Ryan & Deci, 2017). Contexts that are needs-supportive activate in employees positive psychological states that then affect overall well-being, commitment to their job, and willingness to stay (Fernet et al., 2012; Schultz, Ryan, Niemiec, Legate, & Williams, 2015; Van den Broeck et al., 2008). Conversely, working conditions that are diminishing of psychological need satisfaction produce negative employee outcomes such as burnout, low job satisfaction, and turnover (Schultz et al., 2015; Van den Broeck et al., 2008).

In Jen's account above, she experienced her instructional environment as incoherent and ambiguous, which left her frustrated, burned out, and unsure of her plans to return the following year. It seems that Jen's reluctance to return to her school was driven by the negative psychological states she experienced as a result of her working environment. The instructional environment encompasses the daily work of teachers. This study explores instructional program coherence as a potential needs-supportive condition that may activate the satisfaction of teacher psychological needs, and ultimately, affect their intentions to stay in the classroom.

Research Problem

Instructional program coherence emerged in the early 2000s as an organizational condition in schools linked in a handful of studies to increased student achievement and school improvement (Bryk, Sebring, Allensworth, Easton, & Luppescu, 2010; Newmann et al., 2001; Polikoff, 2012; Wonder-McDowell, Reutzel, & Smith, 2011). Following these initial studies, the educational landscape became increasingly driven by accountability, a consequence of which was a shift in research attention toward federal and state policy and away from school and classroom-level improvements (Heck & Hallinger, 2010). A consequence there has been a progressive erosion of knowledge on how school environments are organized to support the *heart* of schools – the instructional core (Bryk, Gomez, Grunow, & LeMahieu, 2015).

This three-part dissertation advocates for a re-emergence of instructional program coherence and positions it within the larger backdrop of the current educational climate which is partially defined by a crisis of the teaching corps. A growing body of evidence points to school-level working conditions as factors that weigh heavily on teacher decisions to stay in their schools or to leave (Allensworth et al., 2009; Boyd et al., 2011; Carver-Thomas & Darling-Hammond, 2017; Guin, 2004; Ingersoll, 2003; Johnson et al., 2012; Ladd, 2011; Loeb et al., 2005; Smith & Ingersoll, 2004; Weiss, 1999). Although working conditions such as teacher autonomy, school leadership, and collegial support are negatively related to turnover, there have been few explorations of how factors specific to the instructional environment are related to teacher turnover. Since the instructional environment is central to teacher day-to-day work experiences, factors that are situated closely with this environment should be explored. Given that instructional program coherence captures the essence of teachers' daily work of instruction, this dissertation explores instructional program coherence as a working condition that may be related to teacher psychological need satisfaction as well as intentions to remain in schools.

Purpose of the Line of Inquiry

This dissertation is composed of three distinct but related papers. The first paper draws on previous literature to conceptualize instructional program coherence as the central construct to be investigated. Using Self-Determination Theory as a theoretical lens, the analysis explores instructional program coherence as an environment that may support teacher sense of well-being, as their psychological needs of autonomy, competence, and relatedness are satisfied. With data collected from two large urban school districts, hierarchical linear modeling (HLM) was used to partition the variance in psychological need satisfaction at the individual teacher and school levels. While autonomy and relatedness satisfaction both vary among schools, interclass

correlations revealed less variance in competence satisfaction at the school level, suggesting that the measurement of competence satisfaction may reflect more of an individual state rather than a collective state among teachers in a school. The relationship between instructional program coherence (IPC) and teacher need satisfaction was tested, yielding significant positive relationships between IPC and autonomy satisfaction as well as between IPC and relatedness satisfaction. These findings suggest that high levels of instructional program coherence are constitutive of an environment that supports teachers in their work by satisfying their needs for autonomy and relatedness.

Building on the findings of the first paper, the second study explored instructional program coherence as a school-level working condition that may be related to teacher intent to stay in their school, as mediated by psychological need satisfaction. Hierarchical linear modeling (HLM) was used to calculate the individual and school-level variance components for the variable teacher intent to leave. Results indicate that teacher intent to leave varies across schools. Using multilevel modeling, the relationship between IPC and teacher intent to leave was tested while controlling for individual teacher variables as well as school-level factors previously established in the literature as having relationships with teacher turnover. Results indicate a significant negative relationship between IPC and teacher intent to leave, net of the other teacher and school variables. Next, teacher psychological need satisfaction was tested as a mediator in the relationship between IPC and teacher intent to leave. As predicted, teacher psychological satisfaction absorbed the variance in teacher intent to leave, suggesting that IPC reduces the likelihood of teachers' intent to leave by working *through* the satisfaction of teachers' psychological needs. These findings may warrant a claim that IPC, as one working condition, creates in teachers a positive psychological state which then reduces their likelihood of turnover.

The first two papers employed an existing measure of IPC developed by Newmann and colleagues (2001) that is well-established in the literature. The evolution of IPC as a construct has exposed limitations of the existing measure, in particular its ability to fully capture the definition of the construct as it has been conceptualized in this work. The existing measure captures only the structural component of IPC, leaving the cognitive dimension yet to be measured. The third study extends the work of instructional program coherence by considering the role of human cognition in the process of crafting coherence in a school environment. The conceptualization of the cognitive dimension of instructional program coherence emphasizes the critical role of alignment in teachers' and leaders' mental models (Honig & Hatch, 2004). It is the shared mental conceptions of teaching and learning that drive the actions that bring about coherence in the instructional environment (Honig & Hatch, 2004).

In this third study, the conceptualization of the cognitive instructional coherence was operationalized as a set of survey items to measure teacher shared mental models of a common instructional framework. These items were then tested empirically to evaluate the validity and reliability of the Cognitive Instructional Coherence scale. Conventional validity tests often follow a unified model in which construct validity is considered a single entity composed of six components: content, substantive, structural, generalizability, external (convergent), and consequential (Messick, 1989, 1995). In this study, items designed to capture dimensions of instructional program coherence were vetted by assessing content validity, structural validity, and convergent validity.

Content validity evaluates the extent to which the items contained in the proposed measurement comprehensively tap the content identified in the conceptual definition (Hopkins, Stanley, & Hopkins, 1990). In the case of this measure, a common instructional framework, a

component of instructional program coherence, is the concept of interest, along with the cognitive science knowledge base that informs the study of mental models. In study 3, the theoretical knowledge base is discussed in regard to how it informed item development. Items were presented to a team of senior educational researchers, who evaluated the items and suggested additions and omissions as well as changes in language and ordering (Benson & Clark, 1982). Next, the items were presented to several teachers who, while reading the items, articulated their initial perceptions of each item. Changes in wording were made to accommodate teacher feedback and to make the items clearer.

Structural validity compares the internal structure of the proposed measure to the structure of the construct being measured (Messick, 1995). In other words, the structure of the items that seek to measure cognitive instructional coherence should match the structural nature of what is known about the components. Because the cognitive dimension of coherence has not yet been measured, this study first explored factor structure using two Exploratory Factor Analyses to 1) test whether or not the cognitive items load onto one factor and 2) to determine whether the cognitive items load onto a distinct factor when all items – both structural and cognitive – are analyzed simultaneously. Following the EFA, a confirmatory factor analysis (CFA) was used to test model fit of the cognitive coherence items. As a final assessment of validity, convergent validity was tested by examining the correlational relationship between cognitive instructional coherence and collective teacher efficacy. Results of the third study confirmed construct validity of the Cognitive Instructional Coherence scale by satisfying standards of evaluation for content validity, structural validity, and convergent validity.

MANUSCRIPT I

Instructional Program Coherence and Teacher Psychological Needs

Instructional Program Coherence and Teacher Psychological Needs

The urgency for schools to get better faster has set many school leaders on a quest to find the "right" programs that will boost achievement scores and improve the quality of instruction (Bryk, 2015). This has partly resulted in district and school leader adoption of multiple programs and initiatives that are often received and implemented in schools exactly how they were packaged and delivered (Fullan & Quinn, 2016). Collections of programs have had the tendency to become chains of isolated efforts that remain in schools for short periods of time and leave schools seemingly unchanged (Bryk, 2015; Finley, 2000; King & Newmann, 2001; Lewis, 2015; Newmann et al., 2001). It is not that reform initiatives in themselves are ineffective but rather that schools lack the capacity to leverage these programs toward focused improvement in teaching and learning (Finley, 2000; Honig & Hatch, 2004; Newmann et al., 2001).

Schools adopt programs with the intention that they will positively affect student outcomes. However, many well-intended initiatives fail to alter student outcomes, largely because they fail to bring coherence to a noisy instructional context (Elmore, 2000; Honig & Hatch, 2004; Jacobson, 2010; Stosich, 2018). To this point, an emerging line of research calls on school leaders to consider the role of instructional program coherence as they engage in school improvement (King & Newmann, 2001; Oxley, 2008). Evidence has established a relationship between instructional program coherence and student performance (Bryk et al., 2010; Newmann et al., 2001), yet there is limited knowledge on the *process* by which instructional coherence can enhance the work of schools. Given that leaders primarily work indirectly through teachers to influence instruction (Leithwood, Patten, & Jantzi, 2010), the purpose of this study was to investigate how instructional program coherence operates as a social mechanism that supports teacher psychological needs.

Defining Instructional Program Coherence

Instructional program coherence generally defines a school environment where curriculum, assessments, and resources are aligned with a common instructional framework (Newmann et al., 2001; Oxley, 2008). A journey toward coherence brings purpose and direction to collaboration among school leaders and teachers on issues related to instruction, it guides purposeful professional development, and it aligns improvement processes with desired outcomes (Garet, Porter, Desimone, Birman, & Yoon, 2001; King & Newmann, 2001; Newmann et al., 2001; Oxley, 2008; Youngs, Holdgreve-Resendez, & Qian, 2011).

In expanding the definition of coherence, Honig and Hatch (2004) argue that coherence is not simply emergent in the objective alignment of resources in the instructional core; it is socially constructed through the ongoing interactions and sensemaking among leaders, teachers, students, instructional materials, and organizational structures (Finley, 2000; Honig & Hatch, 2004; Seashore Louis & Robinson, 2012; Stosich, 2018). Coherence resides as much within norms and mindsets of school members as it does with structural features of schools (Chrispeels, Burke, Johnson, & Daly, 2008; Finley, 2000; Honig & Hatch, 2004). That is, coherence emerges from a shared, collective perception of those who carry out the work in schools (Finley, 2000; Fullan & Quinn, 2016; Honig & Hatch, 2004). In other words, alignment of programs, curricula, assessments, and pedagogy is only effective if there are shared mental conceptions behind decisions and actions of teachers and leaders.

Newmann and colleagues' (2001) emphasis on the structural dimension of coherence and Honig and Hatch's (2004) cognitive perspective constitute emphasis on the two interdependent dimensions of an organized and aligned instructional core. Structurally, a coherent instructional program aligns curriculum, teaching, resources, and assessments vertically and horizontally

across classrooms in a school (Newmann et al., 2001). Cognitively, a coherent environment establishes a shared mental model of desired learning processes and outcomes (Honig & Hatch, 2004).

When integrated, a coherent instructional program resembles an orchestra in which the musicians, instruments, and musical composition are blended in seamless harmony. Structurally, the instruments and individual musical pieces are coordinated to produce the whole compositional piece. Cognitively, musicians' individual and collective performance is guided by a common mental representation of the compositional piece, and the individual instruments and musicians are parts that work in accordance toward the goal of producing the vision of the composition. Similarly, schools with coherent instructional programs are characterized by a common mental representation of teaching and learning that allows the individual components to work in harmony toward a well-articulated vision of instruction (Honig & Hatch, 2004; Newmann et al., 2001).

Foundational to a coherent program is a common instructional framework that is used continually to align curriculum, assessments, resources and materials, professional development, organizational structures, and teacher evaluation. In coherent schools, teachers and administrators work within grade level teams and across grade levels to align content, standards, assessments, and pedagogy both horizontally and vertically (Newmann et al., 2001; Oxley, 2008; Youngs et al., 2011). Using a common instructional framework as a guide, school professionals define how content is connected and builds sequentially both between subject areas and across grade levels. The activities that teachers engage in during professional collaboration times are closely aligned to the instructional framework.

School leader use of an instructional framework is what determines coherence among structural features of the technical core. For instance, when new resources are allocated or new programs adopted, they can be vetted through the lens of the current instructional framework to avoid discontinuity and competing interests among initiatives (Newmann et al., 2001). Leaders can structure feedback and evaluation around the instructional framework so that analysis of lesson plans, use of assessments, appropriateness of instructional materials, and pedagogical methods are not interpreted as isolated parts but are connected through the framework (Newmann et al., 2001; Stosich, 2018; Youngs et al., 2011). When leaders connect feedback to the framework, teachers hear consistent messages and common language that enable them to make sense of the feedback and integrate it into their practice. In addition, leaders might design professional learning opportunities to address the instructional framework so that teachers may meaningfully integrate new knowledge and methods into their understanding of the existing framework (Garet et al., 2001; Newmann et al., 2001; Youngs et al., 2011).

These descriptions provide a picture into the structural components of instructional program coherence, but it is the cognitive feature that undergirds the social process of crafting coherence (Honig & Hatch, 2004). Common planning times, aligned curricula, and carefully designed professional development have limited capacity to reach the instructional core unless teachers and leaders who engage in this process have common mental representations of teaching and learning. As Fullan and Quinn (2016) argue, the process of building coherence must be achieved at the "receiving end, not the delivery end" (p. 6). Mental representations serve the receiving end of coherence, establishing a cognitive structure that enables teachers and leaders to actively engage in the social process of coherence-building through active learning in practice. In short, structural and cognitive dimensions of coherence, when aligned and coordinated,

reinforce each other in ways that affect daily actions and interactions in classrooms (Honig & Hatch, 2004; Newmann et al., 2001).

Performative Value of Instructional Program Coherence

The focus on instructional program coherence emerges from a larger body of evidence that points to coherence as a vital factor in the construction and maintenance of organizational structures and processes (Alagaraja & Shuck, 2015; Biggs, Brough, & Barbour, 2014; Gulledge & Sommer, 2002; Lawrence & Lorsch, 1967). Organizations, particularly ones that are complex, interdependent, and required to continuously adapt and innovate, experience higher performance when they align people, structures, and processes across the organization (Lawrence & Lorsch, 1967). Alignment, when intentionally leveraged by organizational leaders, functions as a sustainable resource that enables organizations to reach their strategic goals through improved processes and outcomes (Powell, 1992).

Performance effects attributed to coherent organizational structures and processes are well established in the general organization literature. Xu, Cavusgil, and White (2006) found in a study of 206 global corporations increased profitability, improved return on investment, and better cash flow for corporations with aligned structures, processes, and marketing standards. Hung, Yang, Lien, McLean, and Kuo (2010) found that within the top Taiwanese technology firms, organizational alignment was related to improved outcomes like competitive advantage, market share, profit, revenue, and customer satisfaction. In 1000 manufacturing and service firms, Bergeron, Raymond, and Rivard (2004) found lower long-term growth and profitability in companies with conflictual strategy, structure, and processes.

Performance effects attributed to coherent organization are not limited to large corporate enterprises. Coherence has consequences for student and school outcomes as well. At the

student level, instructional alignment was related to higher math, reading, and science achievement for over 27,000 teachers and their students (Polikoff, 2012). An experimental study found that instructional alignment had significant, positive effects on the reading achievement of struggling elementary-aged readers (Wonder-McDowell et al., 2011). Additionally, coherence among curriculum standards, resources, instruction, and assessments had a strong association with student test score performance across different subject areas (Squires, 2012). Wellisch, Macqueen, Carriere, and Duck (1978) found that principals' intentional work to coordinate instructional programs was a distinguishing factor between schools with high and low student achievement. Newmann et al. (2001) found larger learning gains in elementary schools in which teachers reported coherent alignment in the instructional core. In later work, Bryk et al. (2010) found instructional coherence to be one of five essential supports for quality learning processes and outcomes in Chicago schools.

The above evidence from general and educational organizations makes a strong case for the critical function of coherence in elevating performance outcomes. There is still, however, limited knowledge on the process through which organizational coherence produces effectiveness. In interdependent organizations like schools, structures and processes can enable or hinder employees in their work (Hoy & Sweetland, 2001). The interdependent nature of complex organizations requires that leaders rely on employees to bring about desired outcomes across the organization. It is likely then that the positive effects that coherence has on student and school outcomes may be explained by the effects it has on those who make the organization functional at the technical level – teachers.

General organizational evidence supports the claim that coherence likely works through employees to elevate performance outcomes. Alagaraja and Shuck (2015) argue that alignment

creates conditions that ignite within employees a psychological state of engagement. As employees perceive the goals, strategies, structures, and processes to be coherent, they are able to make sense of their roles, find meaning in their work, and interpret their daily environment through the lens of organizational goals (Alagaraja & Shuck, 2015). Biggs et al. (2014) found that perceived alignment of job tasks and organizational priorities was related to higher work engagement in Australian police forces.

In school settings, evidence in support of the process by which coherence reaches outcomes is less directly tied to the concept of instructional coherence. Nonetheless, evidence related to characteristics of instructional coherence can be used to make the case that a coherent instruction core has consequences for teachers. For example, Conley and You (2009) found that in a sample of 178 teachers, role ambiguity and role conflict were negatively related to organizational commitment and satisfaction while role overload was not a predictor of these outcomes. Kelley and Finnigan (2003) found that a lack of goal conflict was a positive predictor of teacher motivation. Coherence emerged in several studies as a distinguishing feature of effective professional development that advances school goals and enhances teachers' knowledge, skills, and practice (Firestone, Mangin, Martinez, & Polovsky, 2005; Garet et al., 2001; King & Newmann, 2000; Newmann, King, & Youngs, 2000; Penuel, Fishman, Yamaguchi, & Gallagher, 2007; Youngs & King, 2002). In addition, several studies suggest that teacher collaboration and collective decision-making related to curriculum and instruction have significant effects on teacher outcomes such as organizational commitment and the quality of instruction (Dee, Henkin, & Singleton, 2006; Graham, 2007). One study found that instructional program coherence had positive effects on the quality of beginning elementary teacher induction experiences (Youngs et al., 2011).

With the above evidence in mind, it seems likely that instructional program coherence represents a context in which teachers can perform at high levels. In speculating from the previous evidence, the bridge connecting instructional program coherence to better teaching and learning likely involves teacher psychological needs. As explored next, psychological needs supply the energy behind autonomous motivation, healthy adaptation, and optimal functioning (Ryan & Deci, 2017).

Teacher Psychological Needs

Because school leaders depend on teachers to influence student outcomes, a psychologically healthy and autonomously motivated faculty should be a critical concern of leaders (Ryan & Deci, 2000). Human innate desire to grow and learn is regulated by their psychological needs of competence, autonomy, and relatedness (Ryan & Deci, 2017). This study explores the potential of instructional program coherence as an activator of teacher competence, autonomy, and relatedness.

Competence is defined as an individual's natural desire to feel effective and experience mastery in one's environment (Ryan & Deci, 2017). Autonomy is the need to self-regulate and endorse one's own actions (Ryan & Deci, 2017). Relatedness represents the need to feel socially connected and integrated into one's environment (Ryan & Deci, 2017). In school settings, support for teacher psychological needs is partly facilitated by the decisions and actions of school leaders (Eyal & Roth, 2011). School leaders support teachers' psychological needs through their direct interactions with teachers (Olsen et al., 2017) and in the structures and processes that define the instructional core (Ford & Ware, 2018; Pelletier & Sharp, 2009).

In several studies, positive teaching outcomes have been linked to satisfaction of teacher basic psychological needs (Eyal & Roth, 2011; Ford & Ware, 2018; Lam, Cheng, & Choy, 2010;

Pearson & Moomaw, 2005; Pelletier, Seguin-Levesque, & Legault, 2002; Roth, 2014). Collie, Shapka, Perry and Martin (2016) found psychological need satisfaction to be associated with teacher interpretation of their work environment as measured by well-being, motivation, job satisfaction, and commitment. Similar studies found that teacher perceptions of autonomy satisfaction positively predicted engagement, job satisfaction, and personal accomplishment (Roth, Assor, Kanat-Maymon, & Kaplan, 2007; Skaalvik & Skaalvik, 2016). When school environments satisfy teacher psychological needs, teachers report lower levels of burnout, emotional exhaustion, and intentions to leave the profession (Eyal & Roth, 2011; Pearson and Moomaw, 2005; Roth et al., 2007; Skaalvik & Skaalvik, 2016). Lam et al. (2010) found that as teachers viewed their schools as being supportive of their autonomy, competence, and relatedness, they exhibited greater motivation to try innovative methods in the classroom. At the organizational level, a faculty that operates within a need-satisfying climate tends to hold a stronger sense of collective teacher efficacy (Ford & Ware, 2018). These findings support the claim that teacher psychological needs are linked to inner resources that underlie performance.

Evidence also illuminates the more proximal effects that teacher psychological needs have on the classroom environment. Ware and Ford (2018) found that as leaders support teacher autonomy, competence, and relatedness, they indirectly influence the learning environment of students. As teachers perceive their leaders as being need supportive, they in turn create classroom climates that are engaging, motivating, and nurturing of student psychological needs (Roth et al., 2007; Ware & Ford, 2018). When teachers perceive pressure from administrators, colleagues, and curriculum, they experience less self-determination for their work, and as a result, exhibit more controlling teaching styles with their students (Pelletier et al., 2002; Taylor,

Ntoumanis, & Standage, 2008). Similarly, when teacher needs are frustrated, they are less likely to create supportive environments for their students (Roth, 2014).

Together these findings suggest that leaders should give much consideration to teacher psychological needs, not only to develop and retain an engaged and motivated faculty but also to indirectly influence the instructional climate in the classroom. Given existing evidence, teacher psychological need satisfaction presents a probable pathway by which coherence achieves its positive effects on the instructional core. Thus, this research turns to teacher basic psychological need satisfaction as a teacher condition that may be related to instructional program coherence.

Linking Instructional Program Coherence and Teacher Psychological Needs

As argued previously, crafting coherence has positive consequences for student and school outcomes (Bryk et al., 2010; Newmann et al., 2001; Polikoff, 2012; Squires, 2012; Wellisch et al., 1978; Wonder-McDowell et al., 2011). An open question behind this study addressed the process by which coherence affects student learning and growth. Given the weight that psychological needs bear on teacher performance and well-being (Deci & Ryan, 2016), it is reasonable to conjecture that instructional program coherence creates an environment that satisfies teacher basic psychological needs. The satisfaction of one's basic psychological needs is reflected in the degree to which one's social environment *supports* autonomy, competence, and relatedness (Ryan & Deci, 2017). As argued next, the link between instructional program coherence and teacher psychological needs resides in the autonomy, competence, and relational support experienced from an aligned and coherent instructional core.

A coherent instructional environment supports teacher need for autonomy by providing adaptable structure to an ambiguous and often ill-defined task. Autonomous action is characterized by volition, self-regulation, and meaningful intent (Ryan & Deci, 2017). In the

work context, autonomous action is facilitated when roles, expectations, and tasks are perceived as clear and organized (Donnelly & Ivancevich, 1975; De Ruyter, Wetzels, & Feinberg, 2001). In teaching, uncoordinated programs and resources can detract from teacher ability to make sense of their role as instructors (Honig & Hatch, 2004). Role conflict and role ambiguity are two teacher stressors stemming from operational conditions that affect psychological processes related to teacher volition and internal control (Conley & You, 2009). An uncoordinated instructional program creates an ambiguous work environment for teachers as they experience unclear expectations, conflicting demands, and uncertainty in how their efforts should bring about desired outcomes (Conley & You, 2009). If teachers regularly sift through multiple resources and manage conflicting demands, it is easy to understand how they might become overwhelmed by the noise that surrounds the complexity of planning and delivering meaningful instruction.

As argued by Honig and Hatch (2004), crafting coherence is an ongoing process of establishing clarity and adaptable structure to support a school's vision and strategic objectives. For teachers, a coherent instructional environment reduces complexity by constructing a common focus within a school, it brings clarity to roles and expectations, and it facilitates sensemaking and continuous improvement (Honig & Hatch, 2004; March, as cited in Stosich, 2018). Structure achieved through instructional coherence is designed to be enabling and not externally controlling, and if achieved, such conditions can activate teacher autonomy (Ryan & Deci, 2017; Jang, Reeve, & Deci, 2010). Given this argument, it was hypothesized that:

H1: Instructional program coherence is positively related to teacher-perceived autonomy.

Building on this same argument, it is logical to reason that as teachers work within a well-coordinated, coherent instructional environment, they are better equipped to plan and deliver coherent instruction and thus experience this environment as supportive of their competence. The need for competence is satisfied when one feels that his or her own actions can bring about desired outcomes (Ryan & Deci, 2017). The central and clear focus of a common instructional framework, and aligned resources and processes, make explicit the pathways that should lead to positive classroom outcomes and introduce simplicity into an often chaotic collection of resources, programs, curriculum, and standards (Honig & Hatch, 2004). Honig and Hatch (2004) argue that coherence equips teachers to "behave confidently in the face of complexity and ambiguity" (p. 20), thereby supporting their need for competence.

A coherent instructional program is also one in which teachers engage in sensemaking, learning, and continuous improvement (Honig & Hatch, 2004; Newmann et al., 2001). Teacher competence builds as they engage in continuous collaboration with colleagues and sustained professional development linked to a common instructional framework (Jacobson, 2010; King & Newmann, 2001). Much evidence suggests that the effectiveness of professional development depends in part on the degree to which it connects to an overarching framework, is integrated into continued professional collaboration, and builds *collective* expertise among faculty (Firestone et al., 2005; Garet et al., 2001; Jacobson, 2010; King & Newmann, 2001; Newmann et al., 2000; Youngs et al., 2011). A coherent instructional program lays the foundation for the building and maintenance of collective expertise, systems of effective collaboration, and ultimately, teacher competence. Given this argument, it is hypothesized that:

H2: Instructional program coherence is positively related to teacher-perceived competence.

The ongoing social construction of instructional coherence involves school leaders and teachers working toward a common vision (Honig & Hatch, 2004; Youngs et al., 2011). This process creates in individuals a sense of congruence with the organization. As teachers engage in the collective pursuit of common goals related to the instructional framework, they develop an affective attachment to the school (Forsyth, Adams & Hoy, 2011). When individuals feel socially connected and integrated into an organization, they experience feelings of belonging and meaning (Ryan & Deci, 2017). This sense of relatedness is elevated in social settings in which individuals feel that they are able to make significant contributions to the group, as is common in coherent school organizations (Ford, 2014) Given this argument, it is hypothesized that:

H3: Instructional program coherence is positively related to teacher-perceived relatedness.

Method

This study used a non-experimental cross-sectional design to test the hypotheses. Data were collected in spring 2017 from a sample of teachers in 79 urban elementary and middle schools within two large districts in a Southwestern city of the United States. Data collection for this study was part of a larger research endeavor that examined school climate indicators through the survey of students, teachers, principals, and parents. Only teacher responses were used in this study. Schools in the sample had an average free and reduced lunch rate of 68 percent with an average of 70 percent of students identifying as a minority racial group. Elementary schools represented 82 percent of the sample, and middle schools 18 percent.

Teachers in each school were randomly assigned to receive either a survey that measured school organizational conditions, like instructional program coherence, or a survey that measured individual teacher psychological states. All teachers in both districts received an email that invited them to participate in the survey. Each teacher received a link to either Form A or Form B of the survey. Teacher responses were deidentified of personal information to maintain anonymity. A total of 1,261 teachers received the survey on organizational conditions and there were 870 usable responses, yielding a 70 percent response rate. A total of 1,256 teachers received the survey on individual teacher psychological states and there were 830 usable responses, yielding a 66 percent response rate.

Measures

Instructional program coherence (Table A1) was measured with survey items from the Consortium on Chicago School Research (see https://consortium.uchicago.edu/). Items ask teachers to report on the curricular alignment in the school, the continuity of programs, and the degree to which elements of the instructional program are coordinated and evaluated. Items are measured on a 6-point Likert scale. Sample items include: “Curriculum, instruction, and learning materials are well coordinated across the different grade levels in this school;” “You can see real continuity from one program to another at this school;” and “Once we start a program, we follow up to make sure it is working.” Psychometric tests of the items with data from this study report good structural validity with factor loadings ranging from .75 - .90 and excellent inter-item consistency as measured with a Cronbach alpha of .94.

Faculty trust in principal (Table A2) and faculty trust in colleagues (Table A3) were measured with items from the Omnibus Trust Scale (Forsyth et al., 2011; Tschannen-Moran, 2014). Items ask teachers to report on the degree to which they judge teaching colleagues and

principals to be benevolent, open, honest, competent, and reliable. Items measuring faculty trust in principal include: “The principal in this school typically acts in the best interest of teachers” and “Teachers in this school trust the principal.” Items measuring faculty trust in colleagues include: “Even in difficult situations, teachers in this school can depend on each other” and “Teachers in this school are open with each other.” Both measures employ a 6-point Likert scale. Psychometric tests of the items with data from this study report good structural validity with factor loadings ranging for trust in colleagues ranging from .73 - .90 and for trust in principal ranging from .85-.94. Inter-item consistency was excellent for both measures with trust in colleagues having a Cronbach alpha of .94 and trust in principal .97.

Teacher perceived autonomy (Table A4) and competence (Table A5) were measured with items adapted from the Basic Need Satisfaction at Work Scale, both along a 6-point Likert scale (Deci, Ryan, Gagne, Leone, Usunov, & Kornazheva, 2001). Sample items for autonomy satisfaction include: “At work, I feel a sense of freedom in the things I undertake;” “I feel my choices in my job express who I really am;” and “My daily activities at work feel like a chain of obligations (r).” Sample items for competence satisfaction include: “When I am at work, I feel competent to achieve my goals;” “I have serious doubts about whether I can do things well in my job (r);” and “At work, I feel capable at what I do.” Psychometric tests of the items with data from this study report good structural validity for autonomy satisfaction with factor loadings ranging from .72-.80, and adequate structural validity for competence satisfaction with factor loadings ranging from .55-.82. Inter-item consistency was good for autonomy satisfaction with a Cronbach alpha of .84 and adequate for competence satisfaction with a Cronbach alpha of .75.

Teacher perceived relatedness (Table A6) was measured on a 6-point Likert scale with items adapted from the Organizational Commitment Questionnaire (Porter, Steers, Mowday, &

Boulian, 1974). Items ask teachers to report on their overall sense of loyalty, commitment, and belonging to their school. Sample items include: “I am willing to put in a great deal of effort beyond what is normally expected to help this school succeed;” “I find that my values and the values of this school are similar;” and “I feel strong loyalty to this school.” Scale reliability, as measured by Cronbach’s alpha, was 0.93. Psychometric tests of the items with data from this study report good structural validity with factor loadings ranging from .72 - .91 and excellent inter-item consistency as measured with a Cronbach alpha of .93.

Analysis

Descriptive and bi-variate correlations for teacher and school level variables were calculated first. These results describe the sample of teachers and schools and report correlations between teacher characteristics and their psychological needs, as well as associations between measured school conditions.

Hypotheses were tested in HLM 7.0 with restricted maximum likelihood estimation. All variables were standardized to a mean of 0 and a standard deviation of 1. An unconditional random effects ANOVA was used to partition variance in each psychological need to individual and school differences. Variance components were used to calculate IntraClass Correlation Coefficients for each measured psychological need. Next, a random intercepts ANCOVA was used to account for school differences in psychological needs (Raundenbush & Bryk, 2002). A stepwise approach was followed with teacher level controls and school level controls entered in model one. Instructional program coherence was entered in model two, allowing the unique effect of instructional program coherence to be estimated.

Sample equations for the unconditional effects ANOVA and the full random intercepts ANCOVA follow. As seen, autonomy satisfaction (AS) was estimated to be a function of the

school mean for autonomy satisfaction (β_{0j}) and unexplained variance ($r$ij). For the random intercepts ANCOVA, autonomy satisfaction was modeled as a function of the school average (β_{0j}), years teaching (β_{1j}), years in current school (β_{2j}), and unexplained variance ($r$ij). School level variance in autonomy satisfaction was modeled as a function of the grand mean (γ_{00}), school FRL rate (γ_{01}), percent Caucasian (γ_{02}), faculty trust in colleagues (γ_{03}), faculty trust in principal (γ_{04}), and instructional program coherence (γ_{05}). Teacher and school variables were grand mean centered.

Unconditional Random Effects ANOVA

Level 1: $AS_{ij} = \beta_{0j} + r_{ij}$

Level 2: $\beta_{0j} = \gamma_{00} + u_{0j}$

Random Intercepts ANCOVA

Level 1: ASij = β_{0j} + β_{1j}(Years Teaching) + β_{2j}(Years School) + $r$ij

Level 2: $\beta 0j = \gamma_{00} + \gamma_{01}$(ZFRLj)+ γ_{02}(Z percent Caucasianj)+ γ_{03}(FTC) + γ_{04}(FTPj) + γ_{05}(IPCj) + u_{0j}

$\beta_{1j} = \gamma_{10} + u_{1j}$

$\beta_{2j} = \gamma_{20} + u_{2j}$

Limitations

The analysis, as it is correlational in nature, presents limitations relevant to the internal validity of the study. Because the school context is complex and is comprised of multiple factors, both at the teacher and school levels, it is possible that the lack of experimental controls used in this study could have consequences for the associations that the analysis uncovered. Although the analysis controlled for teacher level characteristics such as gender, National Board

Certification status, number of years teaching, and number of years in a particular school, there are likely other individual characteristics that may operate as confounding variables. The same may be true at the school level, although the analysis controlled for school-level differences in faculty trust in principal and colleagues, free and reduced lunch rates, and percent Caucasian. The results, as reported below, should be interpreted with these limitations in mind.

Results

Descriptive statistics and bivariate correlations for teacher and school variables are presented first. As seen in Table 1.1, teachers averaged about 12 years of teaching experience and were in their current school for approximately six years. The majority of teachers identified as female, and about 10 percent had achieved National Board Certification. Teaching experience (r = 0.2 for autonomy satisfaction, r = .24 for competence satisfaction, and r = 0.10 for relatedness satisfaction) and years in current school (r = -0.04 for autonomy satisfaction, 0.21 for competence satisfaction and r = .10 for relatedness satisfaction) were the only teacher characteristics related to psychological needs. As expected, each psychological need was related to the others.

Table 1.1

Descriptive Evidence for Teacher Variables

Teacher Variables	Mean	SD	AS	CS	RS	YT	YiS	NBC	Female
AS	3.7	1.0	1.0	.36**	.49**	.02	-.04	-.04	-.04
CS	4.9	.88		1.0	.32**	.24**	.21**	.04	.09*
RS	4.9	.97			1.0	.10**	.10**	-.02	.05
Years Teaching	12.38	9.11				1.0	.56**	.04	.05
Years in School	5.95	6.10					1.0	.03	.08*

NBC	.10	-----		1.0	.01
Female	.85	-----			1.0

Note. N = 830 teachers. **p<.01. *p<.05. AS = Autonomy Satisfaction; CS = Competence Satisfaction; RS = Relatedness Satisfaction; YT = Years Teaching; YiS = Years in School; NBC = National Board Certification.

School level descriptives and bivariate correlations appear in Table 1.2. Schools in the sample had an average free and/or reduced lunch rate of 68 percent and an average minority population of 30 percent. Bivariate correlations report a statistically significant and strong relationship between Instructional Program Coherence and Faculty Trust in the Principal (r = .63, p<.01) and a statistically significant, yet weaker, relationship between Instructional Program Coherence and Faculty Trust in Colleagues (r = .46, p<.01). Instructional Program Coherence did not have a statistically significant relationship with free and/or reduced lunch rate, but it did have a relationship with percent Caucasian (r = .17, p<.05).

Table 1.2

Descriptive Evidence for School Variables

School Variables	Mean	SD	IPC	FTP	FTC	FRL	%Cau
IPC	4.7	.56	1.0	.63**	.46**	-.10	.17
FTP	4.6	.76		1.0	.58**	-.05	.01
FTC	4.8	.46			1.0	-.15	.25*
FRL Rate	.68	.22				1.0	-.65**
%Caucasian	.30	.19					1.0

Note. N= 79 schools. **p<.01. *p<.05. IPC = Instructional Program Coherence; FTP = Faculty Trust in Principal; FTC = Faculty Trust in Colleagues; FRL = Free and Reduced Lunch.

Results of the random effects ANOVA appear in Table 1.3. Results report the decomposition of variance in autonomy satisfaction, competence satisfaction, and relatedness

satisfaction to teacher and school factors. Autonomy satisfaction (ICC = .10) and relatedness satisfaction (ICC = .19) show a clustering effect by school. That is, school membership has something to do with differences in autonomy satisfaction and relatedness satisfaction, allowing the multi-level analysis to proceed. Curiously, competence satisfaction (ICC = .03) does not show a strong clustering effect, suggesting that teacher competence satisfaction in this sample had more to do with individual teacher experiences than school effects or that, indeed, competence is invariable across schools and districts. Limited school-level variance in competence satisfaction prevented the hypothesis from being tested with these data.

Table 1.3

Variance Components for Teacher Psychological Needs

Variable	Teacher Level Variance	School Level Variance
Autonomy	.90	.10**
Competence	.97	.03**
Relatedness	.81	.19**

Note. N = 79 schools. N = 830 teachers. **p<.01.

Evidence used to test the hypotheses for autonomy satisfaction and relatedness satisfaction appear in Table 1.4. For autonomy satisfaction, model one results show that at the teacher level, years teaching ($\beta_{1j} = .06$ $p < .05$) and years in school ($\beta_{2j} = -.09$, $p < .05$) had weak, yet statistically significant relationships with autonomy satisfaction. At the school level, percent Caucasian ($\gamma_{02} = .15$, $p < .01$) and faculty trust in principal ($\gamma_{04} = .18$, $p < .01$) were the only two statistically significant predictors of autonomy satisfaction. These conditions had small effect sizes by Cohen's (1988) standards. Model one explained approximately 50 percent of the school

variance in autonomy satisfaction. As hypothesized, Instructional Program Coherence was related to autonomy satisfaction (γ_{05} = .21, p < .01) even after controlling for teacher and school conditions. Further, Instructional Program Coherence moderated the effects of faculty trust in principal and percent Caucasian, and its addition to the model increased overall model fit. Explained school level variance changed from 50 percent to 69 percent.

For relatedness satisfaction, model one results report that percent Caucasian (γ_{02} = .14, p < .01), faculty trust in colleagues (γ_{03} = .14, p < .01), and faculty trust in principal (γ_{04} = .18, p < .01) each had statistically significant relationships. These conditions combined to account for approximately 37 percent of the school variance. Similar to autonomy satisfaction, the addition of Instructional Program Coherence in model two changed the nature of the relationships. Consistent with the hypothesis, Instructional Program Coherence (γ_{05} = .28, p < .01) had a statistically significant relationship with relatedness satisfaction. Its addition improved overall model fit, increasing explained school variance from 37 percent to 79 percent. It also moderated the effects of percent Caucasian and faculty trust in the principal but not faculty trust in colleagues.

Table 1.4

Results of the Random Intercepts ANCOVA

Fixed Effects	AS Model 1	AS Model 2	RS Model 1	RS Model 2
Teacher Predictors				
Years Teaching	.06(.04)	.06(.04)	.05(.04)	.05(.04)
Years in school	-.09(.04)*	-.09(.04)*	.05(.04)	.06(.04)
School Predictors				
FRL Rate	.02(.05)	.02(.05)	-.06(.06)	-.05(.05)
%Caucasian	.15(.05)**	.11(.05)*	.14(.05)**	.08(.05)

FTP	.18(.05)**	.05(.06)	.18(.05)**	.01(.06)
FTC	-.06(.06)	-.06(.05)	.14(.06)*	.15(.05)**
IPC	-----	.21(.05)**	-----	.28(.05)**
Deviance (-2 Log likelihood)	2270	2263	2220	2204
Δ Deviance	-58	-65	-80	-76
Explained School Variance	50%	69%	37%	79%

Note. N= 79 schools. N = 830 teachers. **p<.01. *p<.05. FRL = Free and Reduced Lunch; FTP = Faculty trust in Principal; FTC = Faculty Trust in Colleagues: IPC = Instructional Program Coherence. Teacher variables were grand-mean centered and held constant across schools. Variables were standardized to a mean of 0 and standard deviation of 1.

In summary, findings based on this sample suggest that teacher autonomy satisfaction and relatedness satisfaction are psychological states affected by school conditions. Competence satisfaction, surprisingly, with only three percent of variance attributed to school differences, did not show strong school effects. Instructional Program Coherence was the strongest school predictor of autonomy and relatedness satisfaction. Of interest also was evidence indicating that Instructional Program Coherence lessened the unique effect of faculty trust in principal on teacher autonomy and relatedness, suggesting that these school conditions may operate synchronously.

Discussion

The existing body of literature has established instructional program coherence as an organizational factor that has positive effects on student achievement (Bryk et al., 2010; Newmann et al., 2001). What is lacking in the literature is explanation for the process by which these positive effects might occur. Because teachers are proximal to student learning (Hattie, 2008; Leithwood et al., 2010), it was reasoned that coherence achieves its outcomes by creating

the conditions that enable teachers to thrive within the instructional environment. Psychological needs, when satisfied, represent a climate in which teachers are motivated, engaged, and high-performing (Eyal & Roth, 2011; Ford & Ware, 2018; Lam et al., 2010; Pelletier et al., 2002; Pelletier & Sharp, 2009; Ryan & Deci, 2000; Ware & Ford, 2018). Thus, this study sought to advance our understanding of the process by which instructional program coherence satisfies teacher psychological needs.

It was hypothesized that instructional program coherence would be positively related to teacher autonomy, competence, and relatedness. Interclass correlations for teacher competence revealed that too little variance existed at the school level; therefore, competence was not included in the multilevel analysis. As predicted though, instructional program coherence emerged as the strongest predictor of both teacher autonomy and relatedness, findings that are consistent with the larger body of evidence on psychological need satisfaction. To inform leadership practice, it is necessary to situate the empirical evidence within a larger understanding of how teacher autonomy and relatedness can be ignited.

Igniting Teacher Autonomy

Recall that autonomy is the need individuals have to feel that their actions originate from the self rather than from external pressures or demands (Ryan & Deci, 2017). It involves the volition to act and the need to regulate one's own actions (Ryan & Deci, 2017). A rich body of evidence on autonomy satisfaction, particularly that of teachers, provides a foundation upon which our findings can rest (see Pearson & Moomaw, 2005; Gagne & Deci, 2005; Stone, Deci, & Ryan, 2009). In autonomy-supportive schools, leaders empower teachers by distributing authority to make instructional decisions, promoting reflective inquiry, encouraging critical thinking, and developing collective knowledge and expertise among faculty (Pearson &

Moomaw, 2005; Stone et al., 2009). Another way that leaders support the autonomy of their employees is by providing choice and flexibility within structure, particularly by clarifying responsibilities and tasks (Stone et al., 2009). Gagne and Deci (2005) suggest that as employees see how parts of their job "fit together into a meaningful unit" (p. 26), they experience their jobs as meaningful and therefore approach their job roles with autonomous motivation.

Evidence in support of a relationship between instructional program coherence and teacher autonomy makes sense within the larger body of evidence on autonomy enabling climates. Recall that a coherent instructional core operates through an instructional framework that organizes curriculum and instruction, resources, and interactions; it also serves as a mental representation for teachers to make sense of mass information in complex situations to determine what is most relevant and meaningful (Honig & Hatch, 2004). Structural and cognitive alignment bring clarity to teacher tasks and responsibilities, allowing them to see clearly the links and connections across content areas and among assessments, curriculum, and resources.

Consistent with the argument made by Gagne and Deci (2005), teachers experience autonomy as they see how the parts of their job "fit together into a meaningful unit" (p. 26). Clarity and structure free up cognitive space so that teachers may approach their roles with cognitive flexibility in the face of difficult and complex classroom situations (Conley & You, 2009; Honig & Hatch, 2004). Teachers have the autonomy then to act as adaptive experts rather than compliant enforcers of scripted instruction. As Stone et al. (2009) suggest, structure enables autonomous action and regulation by clarifying the responsibilities that define employee jobs. A study that examined the effects of instructional program coherence on beginning teacher induction experiences found that novice teachers in schools with coherent programs experienced their environment as having clear expectations and guidelines (Youngs et al., 2011). Our findings

add to this knowledge by suggesting that these effects can be explained by the relationship between coherence and teacher autonomy.

By decreasing the cognitive load on teachers, flexible structure has the potential to encourage self-regulation among teachers, particularly as they engage in critical dialogue during professional collaboration. This explanation is consistent with findings suggesting that leaders support employee autonomy by providing opportunities for distributed decision-making, reflective inquiry, critical thinking, and the development of collective expertise (Pearson & Moomaw, 2005; Stone et al., 2009).

Igniting Teacher Relatedness

Recall that relatedness represents one's need to feel socially connected, integrated, and affectively attached in one's environment (Ryan & Deci, 2017). In organizational settings, individuals feel a sense of relatedness when they perceive their work as a significant contribution that aligns with organizational values and benefits other members of the organization (Ryan & Deci, 2017). At the core of one's sense of relatedness and affective attachment to an organization is the feeling of collective responsibility (Ford, 2014; Lam & Lau, 2008). In schools, collective responsibility has been linked to antecedents such as teacher collegiality, collaboration, and shared instructional experiences (i.e., common curriculum, shared learning goals) (Ford, 2014; Lam & Lau, 2008).

Positioning our findings alongside the above evidence, it makes sense that instructional program coherence would have a significant positive effect on teachers' relatedness. Following the work of Honig and Hatch (2004), coherence extends beyond the objective alignment of instructional resources, which this study refers to as the structural feature of coherence. The dynamic social construction of coherence that Honig and Hatch (2004) describe involves

continuous interactions among faculty members – interactions that are structured around the common instructional framework and that support the ongoing alignment of instruction. It was hypothesized that it is through these specific types of social interactions that coherence satisfies teacher relatedness.

The results find continuity with previous research on teacher relatedness. Given that teacher collegiality and collaboration predict teachers' sense of collective responsibility (Lam & Lau, 2008), it makes sense that professional collaboration related to the instructional framework would ignite within teachers a feeling of congruence with the organization, a sense of collective belonging, and a feeling of security among colleagues. In coherent schools, teachers engage regularly in collaborative activities that facilitate critical dialogue, reflective inquiry, and collective alignment toward a common vision of teaching and learning (Newmann et al., 2001; Youngs et al., 2011). Through structured dialogue and collaboration, teachers can develop a growing repertoire of shared instructional experiences that create collective ownership and responsibility (Ford, 2014). Teacher connectedness, ownership, and responsibility lay a foundation for relatedness (Ryan & Deci, 2017). The work that takes place within collaboration times is integrated around the unifying vision of the instructional framework. Teachers are able then to find meaning in their work as they see how it relates to the school's vision, and this meaning satisfies teacher relatedness (Ryan & Deci, 2017). Youngs et al. (2011) found that novice teacher induction experiences were enhanced when their opportunities to collaborate with colleagues were specifically structured around the instructional framework. Our findings add to this evidence by suggesting that instructional program coherence works through teachers by satisfying their need for relatedness.

Implications for Future Research

Limitations of the current study present opportunities for further research in the areas of instructional program coherence and teacher psychological needs. The study's initial goal was to test the relationship between instructional program coherence and teacher competence. However, due to the limited variance available at the school level, this hypothesis could not be tested using this dataset. Further research may inquire into the effects of instructional program coherence on teacher competence at the individual teacher level. It seems reasonable to believe the teacher individual experiences of the instructional core would be capable of igniting or constraining competence.

Another limitation is that the measure of instructional program coherence addresses only the structural components of coherence, as reflected in teacher perceptions of the alignment of organizational structures. This means that the cognitive argument remains largely theoretical and speculative. Future research may advance a more accurate measure of the construct that aligns more closely with our definition, which distinguishes the structural and cognitive features of coherence. Measurement of the cognitive dimensions of instructional program coherence would allow a more rigorous and complete test of the theory that has been built in this study.

Regardless of limitations, this study adds knowledge and explanation about the psychological processes activated by a coherent instructional program. Previous research identified instructional program coherence as an important organizational factor that has positive effects on student outcomes (Bryk et al., 2010; Newmann et al., 2001) as well as for particular experiences for novice teachers (Youngs et al., 2011). New knowledge generated from the findings builds understanding of the *process* by which instructional program coherence creates

the conditions that enable teachers in their work. A coherent instructional program works through teachers by satisfying their needs for autonomy and relatedness.

In practice, school leaders who wish to build a coherent instructional program need more knowledge than just the claim that coherence has positive effects on student achievement. Theory and explanation are the driving forces behind successful practice. When designing a coherent program, leaders should understand the process by which positive effects occur so that their actions are well-informed. This study begins to unpack the positive effects of coherence by pointing to teacher conditions as a pathway by which coherence operates. More specifically, results point to teacher psychological needs as a means through which scholarship may continue to investigate the effects.

MANUSCRIPT II

Instructional Program Coherence and Teacher Intent to Leave

Instructional Program Coherence and Teacher Intent to Leave

The teacher shortage is a problem that spans the educational landscape across the United States and is increasingly a point of conversation among education policymakers, school district officials, and media outlets (Ingersoll, 2001). In the United States, the supply of teachers continues to decline at a persistent rate, and experts project that the gap between teacher supply and demand will only widen in the coming years due to factors such as a growing student population, decreasing enrollment of college students in education programs, and most predominantly, a growing attrition rate of teachers already in the system (Sutcher, Darling-Hammond, & Carver-Thomas, 2016, 2019).

Many states have responded to teacher shortages in ways that have exacerbated the problem. For example, states have lowered standards for certification and placed a growing number of unqualified teachers in the classroom (Espinoza, Saunders, Kini, & Darling-Hammond, 2018). Carver-Thomas and Darling-Hammond (2017) report that in the 2017-18 school year, 100,000 classrooms in the United States were occupied by unqualified teachers. In Oklahoma, the context for this study, the number of emergency certifications in the 2018-19 school year is almost 95 times that of the number in 2011-12, increasing from 32 in 2012 to 3,034 certifications in 2019 (Oklahoma State Department of Education, 2019). Unqualified teachers are typically less effective, and they leave the profession at rates two to three times higher than teachers who are considered fully prepared (Borman & Dowling, 2008; Sutcher et al., 2016; Espinoza et al., 2018). Lower entry standards seem to be widening the supply-demand gap and simultaneously decreasing the effectiveness of the teacher corps.

Scholars have attempted to get to the root of problems related to widespread teacher shortages. On the surface, shortages may appear to be a problem of recruitment; however, studies

show that the source of staffing problems in the U.S. is not one of low supply but of low retention (Ingersoll, 2001, 2002; Guarino, Santibanez, & Daley, 2006). In fact, 90 percent of the demand for teachers in the U.S. is a result of teachers leaving the profession, and two thirds of these teachers leave for reasons other than retirement (Carver-Thomas & Darling-Hammond, 2017). Ingersoll (2002) likens this problem to a "bucket rapidly losing water because of holes in the bottom" (p. 42). In the same way that pouring more water into the bucket will not solve the problem unless the holes are first repaired, attracting more teachers to the profession will not resolve the shortage unless conditions that contribute to teacher turnover are first addressed (Ingersoll, 2002).

Teacher work conditions have worn several gaping holes in the workforce bucket. Heightened pressure, rigid control, relational tensions, and ineffective leadership contribute singularly and collectively to draining good educators from schools and the profession. An organizational feature receiving less attention is coherence among the structures, resources, processes and practices used to coordinate learning across classrooms in schools. The purpose of this study was to explore the relationship between a coherent instructional program and teacher willingness to leave their school. The study was informed by literature on teacher turnover, instructional coherence, and self-determination theory.

Factors Associated with Teacher Turnover

Individual Characteristics

Early research on teacher turnover assumed that individual teacher characteristics and compensation policies were the primary contributors to attrition (Allensworth et al., 2009; Borman & Dowling, 2008). Studies of teacher experience revealed that early- and late-career teachers are most likely to leave the classroom while teachers in the middle of their tenure are

more likely to stay (Grissmer & Kirby, 1997; Guarino et al., 2006). The attrition rate of new teachers has drawn much attention; rates have steadily increased over the last two decades, now showing that more than 42 percent of new teachers leave the profession within the first five years (Ingersoll, Merrill, & Stuckey, 2014; Perda, 2013). In Oklahoma, the context of this study, this rate is even higher; about 46 percent of new hires exit the profession within the first five years (Oklahoma State Department of Education, 2018). With the number of emergency certifications on the rise, Oklahoma could be facing even greater threats to the retention of new teachers in the coming years since data show that the most likely leave the profession to prematurely are those who entered the profession through non-traditional routes such as emergency certification or through programs such as Teach for America (Oklahoma State Department of Education, 2018). Although these individual characteristics of teachers have associations with turnover, they do not account for differences among schools in the same districts. If turnover is primarily a function of backgrounds and characteristics of individual teachers, one would expect turnover rates to remain somewhat constant across schools in a district. Since teacher stability does in fact vary across schools, there must be other factors that weigh on teacher decisions to stay or leave (Allensworth et al., 2009).

One of the most obvious predictors of turnover in any field, salary, seems to matter in retaining teachers, a finding that has been confirmed by multiple studies over decades (Gritz & Theobald, 1996; Imazeki, 2005; Ingersoll, Alsalam, Bobbitt, & Quinn, 1997; Mont & Rees, 1996; Murnane, Singer, & Willett, 1989; Rees, 1991). A recent report by Carver-Thomas and Darling-Hammond (2017) compared teacher turnover in districts with a maximum salary greater than $72,000 and districts with a maximum salary less than $60,000. Even after accounting for other factors, they found that teachers employed in the districts with higher maximum salaries

were 20 to 31 percent less likely to leave their schools (Carver-Thomas & Darling-Hammond, 2017).

While compensation remains a correlative of teacher attrition, it does not explain the disparities of turnover that exist among schools in the same district when teachers across those schools are on the same salary schedule. In fact, several studies reveal that when salary is evaluated alongside other factors, its predictive power notably decreases, suggesting that salary, although still a contributing factor, may not be the most salient, and most certainly not the only, predictor of teacher attrition (Ingersoll, 2003; Boyd et al., 2011; Loeb et al., 2005; Smith & Ingersoll, 2004; Weiss, 1999). The large variation in teacher stability across schools in the same district suggests that there are conditions at the school level that may account for more significant variation in retention rates.

School-Level Characteristics

One school-level factor that has received much attention in the literature is student demographics (Carroll, Reichardt, & Guarino, 2000; Guarino et al., 2006; Hanushek, Kain, & Rivkin, 2004; Ingersoll, 2001; Shen, 1997; Smith & Ingersoll, 2004). Data consistently show that teachers are more likely to leave schools that serve low-income, minority, and low-achieving student populations (Carroll et al., 2000; Guarino et al., 2006; Hanushek et al., 2004; Ingersoll, 2001; Shen, 1997; Smith & Ingersoll, 2004). These findings raise an important question – is the link between student demographics and teacher attrition a result of teacher dissatisfaction with the students they serve, or are there other factors that these schools have in common that could motivate teacher decisions to leave?

More recent studies have demonstrated that teacher mobility in high-need, low-achieving, and high-minority schools is more a function of the conditions that exist in these schools rather

than a dissatisfaction with the students themselves (Allensworth et al., 2009; Boyd et al., 2011; Carver-Thomas & Darling-Hammond, 2017; Guin, 2004; Johnson et al., 2012; Ladd, 2011; Loeb et al., 2005). Taking a more comprehensive look, scholars have found that these schools typically employ larger percentages of unqualified teachers who have not received adequate preparation, a population that has demonstrated high attrition rates (Carroll et al., 2000; Darling-Hammond, 2003). These schools also tend to be environments with less desirable working conditions and fewer resources while more affluent schools offer teachers more influence in school decision-making, smaller class sizes, and more supportive working conditions (Darling-Hammond, 2003; Harris, 2002; National Center for Education Statistics, 1997). In fact, mounting evidence shows that school-level working conditions absorb much of the variation in the relationship between student demographics and teacher turnover, making these conditions the strongest predictors of outcomes related to teacher well-being and attrition (Johnson et al., 2012; Loeb et al., 2005).

In light of this growing body of evidence, research has turned to working conditions to help explain teacher well-being, job satisfaction, and retention (Allensworth et al., 2009; Boyd et al., 2011; Carver-Thomas & Darling-Hammond, 2017; Darling-Hammond, 2003; Ford et al., 2019; Fuller, Waite, & Irribarra, 2016; Jackson, Rothmann, & Van de Vijver, 2006; Johnson et al., 2012; Hoigaard, Giske, & Sundsli, 2012; Ladd, 2011; Loeb et al., 2005; Pomaki, DeLongis, Frey, Short, & Woehrle, 2010; Sims, 2017; Skaalvik & Skaalvik, 2018; Van den Broeck et al., 2008; Wolgast & Fischer, 2017). One working condition that consistently emerges as particularly salient for teacher outcomes is teacher autonomy (Allensworth et al., 2009; Ingersoll, 2001; Ingersoll et al., 1997; Shen, 1997; Stockard & Lehman, 2004; Weiss, 1999). Teachers who report less influence over their work also report lower overall satisfaction with teaching (Stockard & Lehman, 2004). Teacher perceived autonomy and discretion are also predictive of greater teacher

morale (Weiss, 1999) and commitment (Ingersoll et al., 1997). Considering these findings related to teacher psychological states, it is not surprising that high teacher autonomy has also been linked to lower attrition rates (Allensworth et al., 2009; Guarino et al., 2006; Ingersoll, 2001; Shen, 1997). While measuring a comprehensive list of individual and school factors, Allensworth et al. (2009) found that teacher perceptions of their own influence over school decisions had the strongest relationship with retention. In sum, teachers feel stronger commitment, satisfaction, and willingness to stay in the profession when they are granted influence over the decisions that affect their day-to-day tasks as instructors.

Most studies that identify teacher autonomy as a correlative of turnover also cite administrative support as an accompanying factor and, in many cases, an even stronger determinant in teacher decisions to leave or stay in a school (Allensworth et al., 2009; Borman & Dowling, 2008; Boyd et al., 2011; Ford et al., 2019; Guarino et al., 2006; Ingersoll, 2001; Johnson et al., 2012; Ladd, 2011; Shen, 1997; Sims, 2017; Weiss, 1999). Considering the central role that administrators play in the organization of schools, it makes sense that administrative support would emerge as an even stronger predictor since teacher autonomy and decision-making are largely dependent upon the actions of school administrators (Espinoza et al., 2018). Stockard and Lehman (2004) found that new teachers who taught in schools with less effective leaders and less support also experienced lower job satisfaction. Similarly, Weiss (1999) found that teacher morale was higher for those who perceived strong school leadership and culture. Leadership has also been tied directly to turnover – when teachers perceive greater administrative support and feel that their school leaders understand their concerns, they are more likely to remain in teaching (Allensworth et al., 2009; Ford et al., 2019; Ingersoll, 2011; Johnson et al., 2012; Shen, 1997; Weiss, 1999). Certainly, school leaders are instrumental in the retention

and stability of the teaching corps as they cultivate a supportive school climate with enabling working conditions (Espinoza et al., 2018).

In addition to teacher autonomy and administrative support, teachers seem to value a collegial environment that is characterized by trusting relationships with colleagues and systems of collaboration centered around common goals (Allensworth et al., 2009; Fuller et al., 2016; Johnson & Birkeland, 2003; Johnson et al., 2012; Kraft, Marinell, & Shen-Wei Yee, 2016; Pomaki et al., 2010; Weiss, 1999; Wolgast & Fischer, 2017). Johnson et al. (2012) found that teacher satisfaction and turnover were most strongly predicted by not only principal leadership but also by collegial relationships and a positive school culture that is facilitative of mutual trust and shared commitment to student success. Similarly, Fuller et al. (2016) report that, in addition to school leadership, teacher social cohesion – the degree to which teachers experience a sense of mutual trust and collective responsibility among colleagues – had the most predictive power in accounting for teacher turnover. Measuring a variety of working conditions, Allensworth et al. (2009) found teacher stability to be higher in schools where teachers felt their colleagues were innovative and committed to the same goals of school improvement. Other studies show that colleague support positively predicts teacher morale and commitment (Weiss, 1999), mitigates teacher stress (Deci & Ryan, 2012; Van den Broeck et al., 2008; Wolgast & Fischer, 2017), and serves as a buffer between job workload and teachers' intent to leave (Pomaki et al., 2010).

The scope of this literature brings to light two key points. First, it seems that the significance of collegial relationships on turnover is reflected in the shared norms, common instructional goals, and collective responsibility for student achievement that evolve as a result of a supportive collegial environment. This suggests that supportive relationships with colleagues affect teacher decisions to stay in a school when the interactions are centered around the teaching

and learning environment, affecting the day-to-day work of teachers (Simon & Johnson, 2015). Second, just as teacher perceived autonomy and strong leadership typically emerge together as factors related to turnover, it seems that colleague support and administrative support tend to coexist in schools with low turnover. This points to the crucial role of school leaders in establishing the social-organizational climate that enables positive working conditions for teachers (Johnson et al., 2012; Guarino et al., 2006). As several scholars have noted and as the above evidence suggests, it is the *social* and *organizational* working conditions that matter the most for teacher decisions to stay in the classroom (Jackson et al., 2006; Johnson et al., 2012; Pomaki et al., 2010; Weiss, 1999). Furthermore, drawing on this line of evidence, it seems that the most salient factors for teacher well-being and retention are those that are most proximal to the instructional environment (Johnson et al., 2012). Thus, this study explores the potential of a coherent instructional environment in creating the social-organizational conditions that not only allow teachers to thrive in their roles as instructors but also increase the probability of their retention.

Instructional Program Coherence

The conceptualization and measurement of instructional program coherence emerged from Newmann and colleagues' (2001) work in Chicago schools. They define instructional program coherence as a teaching and learning environment in which instructional resources such as curriculum and assessments are aligned with a common instructional framework (Newmann et al., 2001; Oxley, 2008). In coherent schools, an instructional framework runs as a common thread through the alignment of instructional resources, purposeful professional development, collaboration among teachers and leaders, and school improvement processes (Garet et al., 2001; King & Newmann, 2001; Newmann et al., 2001; Oxley, 2008; Youngs et al., 2011).

Coherence forms as curricular standards and assessments are organized and aligned both vertically and horizontally within a shared framework (Newmann et al., 2001). Systems of collaboration lead teachers and leaders to set common goals and expectations for student learning and to engage in reflective dialogue about student performance (Newmann et al., 2001; Youngs et al., 2011). In coherent schools, professional development focuses on ideas that are sustained over time, and school leaders make explicit the ways that new content is integrated into the school's existing instructional framework (Garet et al., 2001; Newmann et al., 2001; Youngs et al., 2011). Before new programs and initiatives are adopted, they are vetted according to their alignment with the school's vision for teaching and learning (Newmann et al., 2001). In short, Newmann and colleagues' (2001) definition encompasses the structural alignment of schools toward a coherent instructional framework through the ongoing work of aligning resources, structures, and processes that define the instructional core.

Honig and Hatch (2004) add to this definition by calling attention to the social nature of building coherence in schools. They argue that the process of crafting coherence reaches beyond the objective alignment of instructional resources; it is socially constructed as teachers and leaders engage in their work together and as they interact daily with instructional materials and organizational structures (Finley, 2000; Honig & Hatch, 2004; Seashore Louis & Robinson, 2012; Stosich, 2018). The dynamic, social process of continually developing coherence creates in teachers and leaders shared norms, mindsets, and mental models of teaching and learning (Honig & Hatch, 2004). These shared mental models become the drivers of teacher actions in the classroom and thus, underlie the manifestation of coherence in day-to-day instructional decisions. The structural alignment of instructional materials and organizational structures bears insufficient weight on the instructional core unless coherence also exists in the mental

conceptions of teachers and leaders (Finley, 2000; Fullan & Quinn, 2016; Honig & Hatch, 2004). Therefore, the degree of instructional coherence in a particular school is contingent upon two interdependent dimensions – the *structural* alignment of instructional resources and organizational structures; and the *cognitive* alignment in the common mental models of teaching and learning that teachers and leaders hold.

The study of coherent organizations is not exclusive to school settings. In fact, much research in general organizations and large corporations brings to light the importance of coherence in supporting organizational structures and processes as well as accomplishing goals and performance outcomes (Alagaraja & Shuck, 2015; Biggs et al., 2014; Gulledge & Sommer, 2002; Lawrence & Lorsch, 1967). In interdependent organizations that rely on motivated and engaged employees to move the organization toward its goals, the alignment of organizational processes, resources, and structures is necessary to reach those goals (Lawrence & Lorsch, 1967; Powell, 1992). Evidence identifies coherence as a key contributor of organizations' profitability, competitive advantage, profit, revenue, customer satisfaction, and long-term growth (Bergeron et al., 2004; Hung et al., 2010; Xu et al., 2006).

In response to these findings on performative outcomes of coherent organizations, more recent studies have explored the *process* by which coherence achieves these outcomes, specifically by investigating the effects it has on those who make the organization functional – employees. As Alagaraja and Shuck (2015) suggest, a work environment that is purposefully aligned allows employees to find meaning in their work, to see how their role contributes to the larger goals of the organization, to develop shared understanding among colleagues, and to have a coherent lens through which they may interpret their complex work environment. These conditions, they further argue, foster within employees a psychological state of engagement,

which is the fuel that coherence relies on to enhance employee performance (Alagaraja & Shuck, 2015). Biggs et al. (2014) found that, in a sample of Australian police officers, perceived alignment of their job tasks and priorities of the organization resulted in higher engagement. Similarly, Albrecht and Su (2012) found that employees experience engagement and commitment for their work when they find clarity in their role and as they see how their role aligns with organizational goals.

As a parallel to this evidence, studies focused on school outcomes have begun to investigate the effects of a supportive instructional environment on the well-being of the key contributors to that environment – teachers. Skaalvik and Skaalvik (2018) found that when teachers perceive their environment as rich in collegial support and as having consonance with their own values and norms, they report higher well-being and engagement as well as lower likelihood of leaving the profession. Conversely, when teachers feel consumed by incoherent mass information and are unable to identify relevant information and resources, they are more likely to experience burnout and to leave the profession (Hoigaard et al., 2012). Fernet and colleagues (2012) arrived at similar conclusions as they found that teacher role ambiguity – the feeling of not having adequate guidance and clarity to do one's job – predicted burnout. Fuller et al. (2016) found that teacher intent to leave was explained more by teacher perceptions of the social-organizational cohesion of the school (i.e., supportive school leadership, collective responsibility for student learning, and trust among colleagues) than by individual teacher intrinsic motivation. The above evidence suggests that the way that schools organize the social-organizational environment has implications for teacher well-being and willingness to stay in their schools. Indeed, several scholars have argued that the social and organizational factors are

the conditions that matter *most* for teacher attrition, commitment, morale, and overall well-being (Boudrias et al., 2014; Fuller et al., 2016; Johnson et al., 2012; Weiss, 1999).

Many of the primary predictors of turnover – namely, student behavior, teacher autonomy, administrative support, and teacher collegiality – seem to be factors that contribute to the instructional environment, thus affecting the daily experiences of teachers. Taken together, these factors point to the significance of a working environment that is supportive of the instructional core since it is at the center of teacher daily roles and experiences. As Johnson et al. (2012) notes, the working conditions that matter most for teacher retention are those that "shape the social context of teaching and learning." Instructional program coherence represents a working environment that is not only social and organizational in nature but also directly addresses the instructional core (Bryk, 2010; Youngs et al., 2011).

Although there is limited existing evidence that directly links instructional program coherence to teacher turnover, the previously explored factors such as teacher autonomy, administrative support, and collegial support, seem to bear resemblance to the definition of a coherent instructional environment. In a school with coherent instructional programs, teachers and leaders collaborate regularly, maintain open, trusting relationships, and share common goals for student achievement (Newmann et al., 2001; Youngs et al., 2011). Through these interactions, they develop shared norms and processes for the instructional task. Leaders in coherent schools set a culture that is guided by clear expectations, instructional support, and meaningful feedback, all factors that are negatively related to teacher attrition (Johnson et al., 2012; Kraft et al., 2016). In addition, leaders grant teachers autonomy to make instructional decisions, and the coherence of resources allows teachers to focus attention on the most relevant components of the instructional task so that they are not bogged down by the constant sifting of

incoherent curriculum, assessments, standards, and expectations (Honig & Hatch, 2004). The overlap in these working conditions point to instructional program coherence as a potential social-organizational working environment that is negatively related to teacher turnover.

Theoretical Framework

Self-Determination Theory is used as a framework to explain how a coherent instructional environment might shape teacher intentions to remain in their school. At the foundation of Self-Determination Theory is the assumption that individual well-being and motivation are contingent on their interactions with their social environment (Ryan & Deci, 2017; Ryan & Deci, 2000). Individual determination, volition, and performance are a function of the extent to which one integrates into his or her social environment or instead experience frustration from it (Ryan & Deci, 2017). Humans possess a natural desire to learn, grow, and adapt in their day-to-day social settings. Social environments have the potential to either support this innate desire or undermine it, depending on the extent to which elements in the environment satisfy individual psychological needs for autonomy, competence, and relatedness (Ryan & Deci, 2000, 2017).

When conditions in working environments actively support employee integration into their social environment, employees experience commitment, engagement, job satisfaction, and overall well-being (Boudrias et al., 2014; Ryan & Deci, 2017). Conversely, when employees perceive the environment as conflictual to their own values, decisions, and sense of volition, their experiences are associated with negative psychological outcomes such as ill-being, decreased motivation, and burnout (Fernet, Guay, & Senécal, 2004; Ryan & Deci, 2017). In a coherent instructional environment, teachers and leaders continually and socially construct common goals, processes, and norms as they build shared mental models for teaching and

learning (Honig & Hatch, 2004). Through these ongoing interactions, teachers develop a sense of congruence with the organization's goals and values (Ford, 2014; Lam & Lau, 2008).

Given that integration into a work environment relies on one finding alignment with the goals and values of the work, it seems logical that a coherent instructional environment would facilitate teacher social integration as they continually craft these shared norms with colleagues on a daily basis. As a result of this social integration, it makes sense that teachers would also experience self-determination and motivation for their work, resulting in teacher well-being. In contrast, an instructional environment characterized by incoherent instructional resources, frequently shifting goals and programs, and a lack of common norms among colleagues may inhibit teachers from finding alignment and integration with the work. Thus, it seems that teachers in these incoherent environments would be more likely to experience maladjustment and ill-being, ultimately leading to their departure.

Therefore, building on this theoretical framework, it is hypothesized that:

H1: Instructional program coherence is negatively related to teachers' intent to leave their school.

Although recent studies have uncovered various working conditions as predictors of teacher turnover (Borman & Dowling, 2008; Guarino et al., 2006), there is less known about the social-psychological *process* by which these factors affect teacher intent to leave or stay. Specifically, there is need for explanation of the psychological mechanisms that are involved in the relationships between various aspects of the work environment and teacher well-being (Fernet et al., 2012). As mentioned above, Self-Determination Theory claims that human motivation and behavior result from a dynamic interaction between conditions in our social lives and our innate psychological needs. Psychological needs of autonomy, competence, and

relatedness are essential nutrients for optimal human functioning and performance (Ryan & Deci, 2017). Our natural propensity to learn, grow, and thrive depends on the activation of psychological needs (Ryan & Deci, 2000).

Autonomy is reflected in the need to feel that one's actions are self-initiated, that they find congruence with one's own values, and that they are meaningful and relevant to the individual (Ryan & Deci, 2017). Competence is the need to feel effective in one's environment and that one's own actions bring about desired outcomes (Ryan & Deci, 2017). Relatedness is the need to feel social connection and belonging, to find meaning in one's work and relationships, and to experience congruence with the goals of the group or organization to which the individual belongs (Ryan & Deci, 2000, 2017).

Studies in various disciplines show that psychological needs mediate relationships between factors in the work environment and employee outcomes such as burnout, well-being, and engagement (Aldrup, Klusmann, & Ludtke, 2017; Bartholomew, Ntoumanis, Cuevas, & Lonsdale, 2014; Boudrias et al., 2014; Fernet, Austin, Trépanier, & Dussault, 2013; Van den Broeck et al., 2008). This line of research has investigated both job resources (i.e., supervisor support, positive feedback, social support, role clarity) and job demands (i.e., role ambiguity) as potential activators or diminishers of employee well-being (Van den Broeck et al., 2008).

Employees experience satisfaction of their psychological needs when structures and processes in their environment enable their autonomous regulation and when they feel that their actions find congruence with the goals of the organization (Ryan & Deci, 2017; Stone et al., 2009; Ford & Ware, 2018). Their competence is satisfied when they have opportunities to grow and develop professionally and to feel effective in bringing about desired outcomes (Ryan & Deci, 2017). Employee sense of relatedness is satisfied as their environment facilitates

connections with colleagues and allows them to find meaning in their work (Ryan & Deci, 2017; Stone et al., 2009). When activated, these psychological needs fuel employee motivation, engagement, and overall well-being (Collie et al., 2016; Ford & Ware, 2018; Lam et al., 2010; Roth et al., 2007; Ryan & Deci, 2000; Ryan & Deci, 2017).

The instructional environment, central to teacher work, has the capacity to be rich in resources or to be high in demands, thus affecting the relative satisfaction or frustration of teacher psychological needs of autonomy, competence, and relatedness (Niemiec & Ryan, 2009). A coherent instructional climate is characterized the alignment of instructional resources, goals, structures, and processes toward a common vision for learning (Honig & Hatch, 2004; Newmann et al., 2001). This alignment provides clarity in teacher roles and delineates how their efforts should bring about the intended outcomes. It is likely then that coherence and clarity serve as support for teacher sense of competence, increasing the likelihood that they would choose to stay in their school.

In coherent schools, collaborative structures facilitate the development of shared goals and collective responsibility among teachers and leaders (Newmann et al., 2001). It seems that as teachers share a common instructional framework and work toward a collective and coherent vision for student learning, they build a culture of shared responsibility for their work and develop strong social ties with colleagues. Recall that relatedness is satisfied as employees find congruence with the goals and values of the group and experience social integration (Ryan & Deci, 2017). As teacher psychological needs for relatedness are satisfied, it makes sense that they would also be more inclined to remain in their school.

In addition, when teachers are able to make sense of their chaotic instructional environment, they are more likely to find meaning in the work. The flexible structure of the

instructional framework allows them to see how curriculum, assessments, and teaching practices should work together to enable student learning, thus empowering them to initiate their own action autonomously in the face of daily challenges in the classroom. As these supports activate teacher psychological needs for autonomy, it makes sense that they would remain in their school.

Building on the arguments above, it is hypothesized that:

H2: The relationship between instructional program coherence and teacher intent to leave is mediated by the satisfaction of teacher psychological needs for autonomy, competence, and relatedness.

Method

This study used a non-experimental cross-sectional design to test the hypotheses. Data were collected in spring 2017 from a sample of teachers in 90 urban elementary, middle, and high schools within two large districts in a Southwestern city of the United States. Data collection for this study was part of a larger research endeavor that captured school climate indicators through the survey of students, teachers, principals, and parents. Schools in the sample had an average free and reduced lunch rate of 69 percent with an average of 69 percent of students identifying as a minority racial group. Teachers in each school were randomly assigned to receive either a survey that measured school organizational conditions, like instructional program coherence, or a survey that measured individual teacher psychological states and intent to leave. All teachers in both districts received an email that invited them to participate in the survey. Each teacher received a link to either Form A or Form B of the survey. Teacher responses were deidentified of personal information to maintain anonymity. A total of 1,787 teachers received the survey on organizational conditions, and there were 1,153 usable responses, yielding a 64 percent response rate. A total of 1,810 teachers received the survey on

individual teacher psychological states and intent to leave, and there were 1,186 usable responses, yielding a 65 percent response rate. After eliminating cases in which respondents did not complete items from all constructs used in the analyses, there were 990 teacher responses from 90 schools included in the final analyses.

Measures

Instructional program coherence (Table A1) was measured with survey items from the Consortium on Chicago School Research (see https://consortium.uchicago.edu/). Items ask teachers to report on the curricular alignment in the school, the continuity of programs, and the degree to which elements of the instructional program are coordinated and evaluated. Items are measured on a 6-point Likert scale. Sample items include: "Curriculum, instruction, and learning materials are well coordinated across the different grade levels in this school;" "You can see real continuity from one program to another at this school;" and "Once we start a program, we follow up to make sure it is working." Psychometric tests of the items with data from this study report good structural validity with factor loadings ranging from .75 - .90 and excellent inter-item consistency as measured with a Cronbach alpha of .94.

Faculty trust in principal (Table A2) and faculty trust in colleagues (Table A3) were measured with items from the Omnibus Trust Scale (Forsyth et al., 2011; Tschannen-Moran, 2014). Items ask teachers to report on the degree to which they judge teaching colleagues and principals to be benevolent, open, honest, competent, and reliable. Items measuring faculty trust in principal include: "The principal in this school typically acts in the best interest of teachers" and "Teachers in this school trust the principal." Items measuring faculty trust in colleagues include: "Even in difficult situations, teachers in this school can depend on each other" and "Teachers in this school are open with each other." Both measures employ a 6-point Likert scale.

Psychometric tests of the items with data from this study report good structural validity with factor loadings ranging for trust in colleagues ranging from .73 - .90 and for trust in principal ranging from .85-.94. Inter-item consistency was excellent for both measures with trust in colleagues having a Cronbach alpha of .94 and trust in principal .97.

Transformational Leadership Behavior (Table A7) was measured on a 6-point Likert scale with items adapted from the Transformational Leadership Behavior Inventory (Podsakoff, MacKenzie, Moorman, & Fetter, 1990). Items ask teachers to report on the extent to which their leaders set high expectations for employees, encourage group effort, treat employees as individuals, and set an inspirational vision. Sample items include: "The principal at this school develops a team attitude and spirit among faculty/staff;" "The principal at this school behaves in a manner thoughtful of my personal needs;" and ""The principal at this school inspires others with his/her plans for the future." Psychometric test of the items with data from this study report good structural validity with factor loadings ranging from .72 – 93. and good inter-item consistency with a Chronbach alpha of .95.

Teacher perceived autonomy (Table A4) and competence (Table A5) were measured with items adapted from the Basic Need Satisfaction at Work Scale, both along a 6-point Likert scale (Deci et al., 2001). Sample items for autonomy satisfaction include: "At work, I feel a sense of freedom in the things I undertake;" "I feel my choices in my job express who I really am;" and "My daily activities at work feel like a chain of obligations (r)." Sample items for competence satisfaction include: "When I am at work, I feel competent to achieve my goals;" "I have serious doubts about whether I can do things well in my job (r);" and "At work, I feel capable at what I do." Psychometric tests of the items with data from this study report good structural validity for autonomy satisfaction with factor loadings ranging from .72-.80, and adequate structural validity

for competence satisfaction with factor loadings ranging from .55-.82. Inter-item consistency was good for autonomy satisfaction with a Cronbach alpha of .84 and adequate for competence satisfaction with a Cronbach alpha of .75.

Teacher perceived relatedness (Table A6) was measured on a 6-point Likert scale with items adapted from the Organizational Commitment Questionnaire (Porter et al., 1974). Items ask teachers to report on their overall sense of loyalty, commitment, and belonging to their school. Sample items include: "I am willing to put in a great deal of effort beyond what is normally expected to help this school succeed;" "I find that my values and the values of this school are similar;" and "I feel strong loyalty to this school." Scale reliability, as measured by Cronbach's alpha, was 0.93. Psychometric tests of the items with data from this study report good structural validity with factor loadings ranging from .63 - .91 and excellent inter-item consistency as measured with a Cronbach alpha of .93.

Intent to leave (Table A8) was measured on a 6-point Likert scale using items adapted from Meyer, Allen, & Smith (1993). Items ask teachers to report on both the likelihood they would leave their school in the next year and the likelihood they would leave the profession in the next year. In addition, teachers report the frequency that they have thoughts of leaving their school and the teaching profession. Sample items include: "How likely is it that you would leave your school in the next year?"; "How likely is it that you would leave the education profession in the next year?"; and "How frequently do you think about leaving your school?" Psychometric tests of the items measuring teachers' intent to leave the *school* report good structural validity with factor loadings ranging from .56 to .90 and acceptable inter-item consistency as measured with a Chronbach alpha of .78.

Items measuring teacher intent to leave the profession were not used in the final analysis. InterClass Correlation Coefficients revealed that teacher intent to leave the profession varies little at the school level and is perhaps more reflective of individual teacher experiences. Since this study examines the role of the school in creating working conditions that help to retain teachers, our interest in is school-level differences. In the context of teacher attrition, it is just as consequential and disruptive to the individual *school* when a teacher leaves the school as it is when a teacher leaves the profession. One could argue that if a teacher transfers to another school within the same district, the negative effect would be minimized since the teacher may carry district norms, goals and knowledge of curricula to the new site. However, the migration of teachers from one school to another still creates vacancies and breaks the social and instructional cohesion that has been established in that particular school (Allensworth et al., 2009; Boyd et al., 2006; Ingersoll, 2001; Johnson et al., 2012). Any attrition that disrupts the cohesion of the school is of importance.

The teacher intent to leave measure is distinct from the actual rate of turnover in a school. This distinction matters because teacher turnover is a lagging indicator that is captured after a teacher's decision has already been made and after the negative consequences of that turnover have already affected the school. Teacher intent to leave is often accompanied by negative psychological states such as low motivation, burnout, and low organizational commitment (Conley & You, 2009; Firestone & Pennell, 1993; Ford et al., 2019). Thus, these teachers, without even leaving the school, may disrupt the culture, cohesion, and effectiveness of the school As Ford et al. (2019) argues, teacher intent to leave is a "psychological state that precedes unhealthy and preventable turnover," and is "arguably more important to school leaders and policymakers than the turnover rate itself." In addition, Ladd (2011) found teacher intent to leave

to be highly predictive of actual turnover, making the measure an accurate leading indicator of turnover.

Analysis

Descriptive and bi-variate correlations for teacher and school level variables were calculated first. These results describe the sample of teachers and schools and report correlations between teacher characteristics and their intentions to leave, as well as associations among measured school conditions.

Hypotheses were tested in HLM 7.0 with restricted maximum likelihood estimation. All variables were standardized to a mean of 0 and a standard deviation of 1. An unconditional random effects ANOVA was used to partition variance in teacher intent to leave to and the school level variables. The main effect of instructional program coherence on intent to leave was estimated by specifying a One Way Random Effects ANCOVA with gender, years in school, and years teaching included as teacher-level co-variates and with FRL rate, percent Caucasian, faculty trust in principal and colleagues, transformational leadership behavior, and prior achievement as school working conditions and level two co-variates. Teacher variables were constrained to have a common variance across all schools and grand mean centered. School level FRL and prior achievement were also grand mean centered. Grand mean centering is preferable when estimating the net effect of an organizational variable on an individual level outcome (Luke, 2004; Raudenbush & Bryk, 2002).

Sample equations follow. As seen, teacher intent to leave (TIL) was estimated to be a function of the school mean for teacher intent to leave (β_{0j}) and unexplained variance (rij). For the random intercepts ANCOVA, teacher intent to leave was modeled as a function of the school average (β_{0j}), years teaching (β_{1j}), years in current school (β_{2j}), gender (β_{3j}), and unexplained

variance ($r$ij). School level variance in teacher intent to leave was modeled as a function of the grand mean (γ_{00}), school FRL rate (γ_{01}), percent Caucasian (γ_{02}), faculty trust in colleagues (γ_{03}), faculty trust in principal (γ_{04}), transformational leadership behavior (γ_{05}), prior achievement (γ_{06}) and instructional program coherence (γ_{07}). Teacher and school variables were grand mean centered.

Unconditional Random Effects ANOVA

Level I: $TIL_{ij} = \beta_{0j} + r_{ij}$

Level II: $\beta_{0j} = \gamma_{00} + u_{0j}$

Random Intercepts ANCOVA

Level I: $TILij = \beta_{0j} + \beta_{1j}(\text{Years Teaching}) + \beta_{2j}(\text{Years School}) + \beta_{3j}(\text{Gender}) + rij$

Level II: $\beta 0j = \gamma_{00} + \gamma_{01}(\text{ZFRLj}) + \gamma_{02}(\text{Z percent Caucasianj}) + \gamma_{03}(\text{FTC}) + \gamma_{04}(\text{FTPj}) + \gamma_{05}(\text{TLBj}) + \gamma_{06}(\text{PAj}) + \gamma_{07}(\text{IPCj}) + u_{0j}$

$\beta_{1j} = \gamma_{10} + u_{1j}$

$\beta_{2j} = \gamma_{20} + u_{2j}$

The mediating effect of need satisfaction was tested with a 2-1-1 multilevel mediation model. As Baron and Kenny (1986) argue, mediators "explain how external physical events take on internal psychological significance," and they "speak to how and why such effects occur" (p.1176). A 2-1-1 mediation model is used when the antecedent predictor is a school-level variable and the mediator and outcome variables are individual teacher-level variables (Krull & MacKinnon, 2001). The sequence of steps in testing a multilevel mediation model is similar to the process outlined by Baron and Kenny (1986). First, the direct effect of the primary antecedent, instructional program coherence, is tested on the outcome variable, intent to leave.

Second, the relationship between the antecedent and mediating variables is tested. Finally, the third test reports the relationship between the antecedent and outcome variable with the mediators included (Krull & MacKinnon, 2001; Zhang, Zyphur, & Preacher, 2009).

Sample equations for the mediation model follow. As seen, teacher intent to leave (TIL) was estimated to be a function of the school mean for teacher intent to leave (β_{0j}), years teaching (β_{1j}), years in current school (β_{2j}), gender (β_{3j}), autonomy satisfaction (β_{4j}), competence satisfaction (β_{5j}), relatedness satisfaction (β_{6j}) and unexplained variance ($r$ij). School level variance in teacher intent to leave was modeled as a function of the grand mean (γ_{00}), school FRL rate (γ_{01}), percent Caucasian (γ_{02}), faculty trust in colleagues (γ_{03}), faculty trust in principal (γ_{04}), transformational leadership behavior (γ_{05}), prior achievement (γ_{06}) and instructional program coherence (γ_{07}). Teacher and school variables were grand mean centered.

Mediation Model

Level I: $TIL_{ij} = \beta_{0j} + \beta_{1j}(\text{Years Teaching}) + \beta_{2j}(\text{Years School}) + \beta_{3j}(\text{Gender}) \beta_{4j}(AS) + \beta_{5j}(CS) + \beta_{6j}(RS) + r_{ij}$

Level II: $\beta 0j = \gamma_{00} + \gamma_{01}(ZFRLj) + \gamma_{02}(\text{Z percent Caucasian}j) + \gamma_{03}(FTC) + \gamma_{04}(FTPj) + \gamma_{05}(TLBj) + \gamma_{06}(PAj) + \gamma_{07}(IPCj) + u_{0j}$

$\beta_{1j} = \gamma_{10} + u_{1j}$

$\beta_{2j} = \gamma_{20} + u_{2j}$

$\beta_{3j} = \gamma_{30} + u_{3j}$

$\beta_{4j} = \gamma_{40} + u_{4j}$

$\beta_{5j} = \gamma_{50} + u_{5j}$

$\beta_{6j} = \gamma_{60} + u_{6j}$

$\beta 0$ = school mean for teacher intent to leave

$\beta 1$ = years teaching

$\beta 2$ = years teaching in the school

$\beta 3$ = gender (percent female)

$\beta 4$ = autonomy satisfaction of teacher

$\beta 5$ = competence satisfaction of teacher

$\beta 6$ = relatedness satisfaction of teacher

$\gamma 00$ = grand mean for teacher intent to leave

$\gamma 01$ = free and reduced lunch rate of school

$\gamma 02$ = percent Caucasian of school

$\gamma 03$ = faculty trust in colleagues

$\gamma 04$ = faculty trust in principal

$\gamma 05$ = teacher perceptions of the transformational leadership behavior of principal

$\gamma 06$ = prior achievement of school

$\gamma 07$ = instructional program coherence

Limitations

The research design used in this study is correlational in nature, and thus, it presents some limitations pertaining to the internal validity of the findings. Undoubtedly, the complex school environment is made up of an undefined number of factors, both at the individual teacher level and the school level. Teacher level controls included number of years teaching, number of years in the school, and gender. School level controls included faculty trust in colleagues, faculty trust in the principal, percent Caucasian, free and reduced lunch, prior achievement, and transformational leadership behavior of the principal. However, because this study did not use experimental controls, it is possible that additional factors may exist within individual teachers

and among schools, and these differences could confound the findings. The results of the study, reported below, should be interpreted with these limitations in mind.

Results

Descriptive statistics and bivariate correlations for teacher and school level variables are reported first (Table 2.1).

Surveys yielded 990 usable teacher responses. As reported in Table 2.1, teachers had an average of almost 13 years teaching and 6 years in their current school. A majority of respondents identified as female, and about 10 percent held National Board Certification. Of the individual teacher characteristics, intent to leave had a significant relationship with years teaching (r = -.15, p<.01) and years in school (r = -.15, p<.01).

Table 2.1

Descriptive Evidence for Teacher Variables

Teacher Variables	Mean	SD	AS	CS	RS	ITL	YT	YiS	NBC	Female
AS	3.8	1.0	1.0	.38**	.51**	-.51**	.04	-.03	.03	-.04
CS	4.9	.88		1.0	.36**	-.29**	.23**	.21**	-.04	.09**
RS	4.9	.98			1.0	-.63**	.09**	.08*	-.00	.06
ITL	3.0	1.40				1.0	-.15**	-.15**	.00	-.01
Years Teaching	12.7	9.16					1.0	.57**	.02	.03
Years in School	6.1	6.17						1.0	.02	.04
NBC	10%	-----							1.0	.00
Gender (female)	82%	-----								1.0

Note. N= 990 teachers. **p<.01. *p<.05; AS = Autonomy Satisfaction; CS = Competence Satisfaction; RS = Relatedness Satisfaction; ITL = Intent to Leave; NBC = National Board Certification.

School level descriptive data and bivariate correlations are reported in Table 2.2. There were 90 schools in the sample, which had an average free and/or reduced lunch rate of 69 percent and an average minority composition of 69 percent. Instructional program coherence had a strong, significant correlational relationship with Faculty Trust in the Principal (r = .63; p<.01) and Transformational Leadership Behavior of the Principal (r = .61; p<.01). IPC also had a weaker yet still significant relationship with Faculty Trust in Colleagues *(*r = .48; p<.01) and percent Caucasian (r = .21; p<.05). Of the individual teacher characteristics, intent to leave had a significant relationship with years teaching (r = -.15, p<.01) and years in school (r = -.15, p<.01).

Table 2.2

Descriptive Evidence for School Variables

School Variables	Mean	SD	IPC	FTP	FTC	FRL	%Cau	PA
IPC	4.7	.57	1.0	.63**	.48**	-.08	.21*	.12
FTP	4.6	.71		1.0	.57**	.06	.03	.04
FTC	4.7	.44			1.0	-.14	.22	.14
FRL Rate	.69	.21				1.0	-.61**	-.41**
%Caucasian	.31	.20					1.0	.44**
PA								1.0

Note. N= 90 schools. ** p<.01. * p<.05; IPC = Instructional Program Coherence; FTP = Faculty Trust in Principal; FTC = Faculty Trust in Colleagues; FRL = Free and/or Reduced Lunch; PA = Prior Math Achievement.

Results of the random effects ANOVA appear in Table 2.3. Results report the decomposition of variance in IPC, Teacher Intent to Leave, Autonomy Satisfaction, Competence Satisfaction, and Relatedness Satisfaction. Teacher Intent to Leave (ICC = .12, p<.01), Autonomy Satisfaction (ICC =.09, p<.01) and Relatedness Satisfaction (ICC = .18, p<.01) all show a clustering effect by school. Competence Satisfaction (ICC = .03, p<.01), on the other

hand, does not show a strong clustering effect at the school level, suggesting that in this sample, perhaps teacher perceptions of their own competence had more to do with individual experiences than with their membership in a particular school. Because the variation in competence satisfaction was still statistically significant across schools, it was included in the final mediation analysis. However, given that the percentage of school-level variation in teacher competence satisfaction is small, one must interpret results with this in mind.

Table 2.3

Variance Components for Intent to Leave and Teacher Psychological Needs

Variable	Teacher Level Variance	School Level Variance
Intent to Leave	.88	.12**
Autonomy	.91	.09**
Competence	.97	.03**
Relatedness	.82	.18**

Note. N = 90 schools. N = 990 teachers. ** p<.01.

The one-way random-effects ANCOVA tested hypothesis one, estimating the main effect of instructional program coherence on teacher intent to leave while controlling for individual teacher characteristics (years teaching, years in the school, and gender) and school-level factors (FRL rate, percent Caucasian, faculty trust in colleagues, faculty trust in principal, transformational leadership behavior of the principal, and prior math achievement. Results appear in Table 2.4. Model one shows that, of the teacher characteristics included in the model, years teaching ($\beta 1 = -.09$, $p < .01$) was the only statistically significant predictor of teacher intent to leave, with a small effect size by Cohen's (1988) standards. Of the school level variables, percent Caucasian ($\gamma 02 = -.17$, $p < .01$) and faculty trust in principal ($\gamma 04 = -.18$, $p < .01$) were the only two statistically significant predictors of teacher intent to leave, with small effect sizes by Cohen's (1988) standards. Model one explained approximately 58 percent of the school level

variance in teacher intent to leave. Model two (see Table 2.4) reports instructional program coherence as having a main effect on teacher intent to leave (γ_{07} = -.17, $p < .01$). Because all variables were standardized with a mean of 0 and a standard deviation of 1, an increase of 1 standard deviation in instructional program coherence was related to a .17 standard deviation decrease in teacher intent to leave. Instructional program coherence emerged as the strongest predictor of teacher intent to leave amongst the other teacher and school-level controls. IPC moderated the effect of faculty trust in principal, reducing the effect size from -0.18 to -0.09, while also eliminating the significance of the relationship. In addition, percent Caucasian was slightly moderated by IPC but still maintained a significant, yet weaker, relationship with intent to leave. The addition of IPC in model 2 improved model fit and increased the explained school-level variance from 58 percent to 67 percent.

Table 2.4

Results of the Random Intercepts ANCOVA for Intent to Leave

Fixed Effects	Model 1	Model 2
Teacher Predictors		
Gender (female)	.06 (.08)	08 (.08)
Years Teaching	-.06 (.04)	-.06 (.04)
Years in school	-.09 (.03)**	-.10 (.03)**
School Predictors		
FRL Rate	.01 (.04)	.00 (.04)
%Caucasian	-.17 (.05)**	-.12 (.05)*
PriorMath	-.04 (.04)	-.04 (.03)
FTP	-.18 (.06)**	-.09 (.06)
FTC	.02 (.06)	.00 (.05)
TLB	-.03 (.08)	.02 (.06)
IPC	-----	-.17 (.05)**
Deviance (-2 Log likelihood)	2768	2760
Δ Deviance	-76	-84
Explained School Variance	58%	67%

Note. N= 90 schools. N = 990 teachers. **p<.01. *p<.05. FTP = Faculty trust in Principal; FTC = Faculty Trust in Colleagues: IPC = Instructional Program Coherence. Teacher variables were grand-mean centered and held constant across schools. Variables were standardized to a mean of 0 and standard deviation of 1. Reported values reflect fixed effects with robust standard errors.

Results for hypothesis two, involving the mediation of psychological needs in the relationship between IPC and intent to leave, are presented in Table 2.5. Following Barron and

Kenny's (1986) guidelines for testing mediation, the analysis involved testing for three criteria. The first step of establishing a relationship between the antecedent and the outcome variable, was completed. As reported above, instructional program coherence had a significant, negative relationship with teacher intent to leave. The second criterion requires that the antecedent variable is related to the mediating variables. Results for this test confirmed this relationship, as instructional program coherence had a significant, positive association with both autonomy satisfaction ($\beta_4 = .19$, $p < .01$) and relatedness satisfaction ($\beta_6 = .20$, $p < .01$).

Table 2.5

Results of the Random Intercepts ANCOVA for Relational and Autonomy Sat.

Fixed Effects	Relational Sat.	Autonomy Sat.	Competence Sat.
Teacher Predictors			
Gender (female)	.04 (.09)	-.14 (.09)	.19 (.09)*
Years Teaching	.05 (.04)	.09 (.04)*	.18 (.04)**
Years in school	.04 (.04)	-.09 (.04)*	.10 (.03)**
School Predictors			
FRL Rate	-.03 (.03)	.01 (.04)	.00 (.04)
%Caucasian	.04 (.05)	.11 (.05)*	.10 (.04)*
PriorMath	.13 (.04)**	-.02 (.04)	.08 (.04)*
FTP	.01 (.06)	.07 (.05)	.02 (.06)
FTC	.09 (.06)	-.07 (.05)	-.01 (.04)
TLB	.10 (.05)	.01 (.04)	.04 (.05)
IPC	.20 (.05)**	.19 (.05)**	.02 (.04)
Deviance (-2 Log likelihood)	2690	2770	2785
Δ Deviance	-38	-30	-43

Explained School Variance	78%	55%	80%

Note. N= 90 schools. N = 990 teachers. **p<.01. *p<.05. FTP = Faculty trust in Principal; FTC = Faculty Trust in Colleagues: IPC = Instructional Program Coherence. Teacher variables were grand-mean centered and held constant across schools. Variables were standardized to a mean of 0 and standard deviation of 1. Values reflect fixed effects with robust standard errors.

The final test to establish mediation requires that upon entering the mediating variables into the first model, the initial effect of the antecedent on the outcome variable decreases as it is absorbed by the mediator (Baron & Kenny, 1986). The results of this test are reported in Table 2.6. As hypothesized, the addition of teacher autonomy satisfaction and relatedness satisfaction reduced the relationship between instructional program coherence and teacher intent to leave. In model one, IPC (γ_{07} = -.17, p < .01) had a significant negative relationship with intent to leave, and in model 2, this effect decreased almost entirely to .02 and eliminating the significance of the relationship. In model 2, autonomy satisfaction (β_4 = -.27; p < .01) had a small but significant relationship with intent to leave, and relatedness satisfaction (β_6 = -.47, p < .01) had a medium, significant relationship with intent to leave.

The mediation model increased the explained variance from 67 percent, shown in model one (Table 2.6), to 83 percent as teacher psychological need satisfaction accounts for the additional 16 percent in model two. Since teacher psychological needs did absorb much of the variance in teacher intent to leave, it can be considered a partial mediator in the relationship between IPC and intent to leave.

Table 2.6

HLM Results of the mediation test for instructional coherence, psychological needs, and intent to leave

Fixed Effects	Model One	Model Two
Teacher Predictors		
Gender (female)	.08 (.08)	.05 (.07)
Years Teaching	-.06 (.04)	-.01 (.03)
Years in school	-.10 (.03)**	-.11 (.02)**
AS	-----	-.27 (.03)**
RS	-----	-.47 (.03)**
CS	-----	-.00 (.03)
School Predictors		
FRL Rate	.00 (.04)	-.01 (.03)
%Caucasian	-.12 (.05)*	-.02 (.03)
PriorMath	-.04 (.03)	.02 (.02)
FTP	-.09 (.06)	-.07 (.04)
FTC	.00 (.05)	.02 (.05)
TLB	.02 (.06)	.07 (.05)
IPC	-.17 (.05)**	-.02 (.04)
Deviance (-2 Log likelihood)	2760	2272
Δ Deviance	-84	-572
Explained School Variance	67%	83%

Note. N= 90 schools. N = 990 teachers. **p<.01. *p<.05. FTP = Faculty trust in Principal; FTC = Faculty Trust in Colleagues: IPC = Instructional Program Coherence. Teacher variables were grand-mean centered and held constant across schools. Variables were standardized to a mean of 0 and standard deviation of 1. Values reflect fixed effects with robust standard errors.

Discussion

Literature on teacher attrition suggests that working conditions carry the most predictive power in teachers' decisions to stay in their schools or to leave (Allensworth et al., 2009; Boyd et al., 2011; Carver-Thomas & Darling-Hammond, 2017; Guin, 2004; Ingersoll, 2003; Johnson et al., 2012; Ladd, 2011; Loeb et al., 2005; Smith & Ingersoll, 2004; Weiss, 1999). Given the proximity of the instructional environment to teachers' daily work, this study explored instructional program coherence as a school working condition that may have a negative relationship with teachers' intent to leave their school. Additionally, the satisfaction of teacher psychological needs was tested as a mediator in the relationship between IPC and teacher intent to leave.

First, it was hypothesized that instructional program coherence would have a negative relationship with teacher intent to leave while controlling for other teacher and school level variables that have been established as being predictive of turnover. Interclass correlations show variation in teacher intent to leave at the school level, confirming studies that suggest that teacher turnover is a school-level factor that varies across schools in districts. As predicted, instructional program coherence emerged as a significant negative predictor of teacher intent to leave. It maintained the strongest relationship among the other teacher and school variables, namely: years of teaching experience and years in the school, faculty trust in colleagues, faculty trust in the principal, percent Caucasian, free and reduced lunch rate, and transformational leadership behavior of the principal. These findings suggest that how the instructional program is organized has significance for teachers' intentions to remain in their school. It seems that teachers who experience their instructional environment as more cohesive are less likely to have intentions of leaving. In the same way, teachers who experience their environment as incohesive are more

likely to have intentions of leaving. This finding is consistent with existing literature on teacher attrition and general organizations.

Recall that coherence is established when the environment is organized in a way that aligns structures, processes, tasks, and employees toward common goals and shared understanding (Alagaraja & Shuck, 2015; Albrecht & Su, 2012; Biggs et al., 2014). This alignment increases employee satisfaction, engagement, commitment, and even performance (Alagaraja & Shuck, 2015; Albrecht & Su, 2012; Biggs et al., 2014). Within the instructional context, various social and organizational conditions have been linked to similar employee outcomes (Hoigaard et al., 2012; Johnson et al., 2012; Weiss, 1999). Fuller et al. (2016) found that teachers expressed lower intentions to leave their school when they experienced the social-organizational environment of the school as having social cohesion, as measured by supportive leadership, collective responsibility for student learning, and trust among colleagues. Skaalvik and Skaalvik (2018) found that when the school context is strong in collegial support and such that teachers find congruence with the norms, values, and goals of the school, teachers report higher well-being, greater engagement, and lower intentions to leave. Hoigaard et al. (2012) suggest that teachers are more likely to reach a state of burnout and to consider leaving the profession when they feel overwhelmed by mass and often conflictual information which makes it difficult to identify the information most relevant to their tasks as instructors. Similarly, teachers are more likely to report burnout when they feel that they lack guidance and clarity in their work (Fernet et al., 2012).

Together, these findings, although none of the studies directly measure instructional program coherence, draw out the importance of coherence in the instructional core, clarity in expectations and roles, and continuity in norms and goals. These factors matter for teacher

engagement, well-being, and retention (Fernet et al., 2012; Ford et al., 2019; Hoigaard et al., 2012; Skaalvik & Skaalvik, 2018). Our findings fit well with this line of research as instructional program coherence represents an environment in which the alignment of instructional programs provides clarity and guidance, establishes shared norms and goals among staff, and unites teachers and leaders toward a collective responsibility for student learning (Honig & Hatch, 2004; Newmann et al., 2001). Thus, it makes sense that instructional program coherence would have a negative relationship with teacher intent to leave. In addition to establishing this relationship, this finding raises questions about *how* and *why* a coherent instructional environment might be negatively associated with teachers' intent to leave their school. Psychological processes can help explain how elements of the social-organizational work environment affect employees' turnover decisions (Ford et al., 2010; Richer, Blanchard, & Vallerand, 2002).

In light of this, it was hypothesized that the satisfaction of teacher psychological needs would mediate a relationship between instructional program coherence and teacher intent to leave. As predicted, the satisfaction of teacher psychological needs absorbed most of the variation in teacher intent to leave, establishing it as a mediator in the relationship between IPC and teacher intent to leave. It seems that instructional program coherence activates in teachers a psychological state that influences their decisions to stay in their school. Positioning this finding within the larger body of literature related to social-psychological processes brings to light the significance of these new findings and helps to explain *how* and *why* a coherent instructional environment would increase teachers' willingness to stay.

When teachers' psychological needs are satisfied, they are motivated, engaged, satisfied with their job, and committed to the organization (Eyal & Roth, 2011; Ford & Ware, 2018; Lam

et al., 2010; Pelletier et al., 2002; Pelletier & Sharp, 2009; Ryan & Deci, 2000; Ware & Ford, 2018). Furthermore, studies show that the satisfaction of these needs also negatively predicts burnout, emotional exhaustion, and intentions to leave the school or the teaching profession (Eyal & Roth, 2011; Ford et al., 2019; Pearson and Moomaw, 2005; Roth et al., 2007; Skaalvik & Skaalvik, 2016; Van den Broeck et al., 2008). Building on this argument that psychological needs are consequential for teacher well-being, this study's findings link teacher psychological needs to their intentions to stay in their school.

Much evidence suggests that the social-organizational environment has the potential to either support teacher psychological needs or to diminish their needs (Aldrup et al., 2017; Bartholomew et al., 2014; Eyal & Roth, 2011; Ford & Ware, 2018). The degree to which this occurs depends on how teachers perceive elements in the environment as being supportive of their needs for autonomy, competence, and relatedness (Ryan & Deci, 2017). In our study, instructional program coherence was positively related to teacher need satisfaction, which in turn was negatively related to teacher intent to leave. This suggests that a coherent instructional environment is a type of needs support that activates teacher autonomy, competence, and relatedness, which influences teachers' intentions to stay in their school.

This is consistent with other studies that have found teacher need satisfaction to mediate relationships between elements in the social-organizational environment and outcomes such as burnout, turnover, and ill-being (Boudrias et al., 2014; Fernet et al., 2012; Ford et al., 2019; Van den Broeck et al., 2008). Boudrias and colleagues (2014) found that resources in the social-organizational climate of schools predicted teachers' psychological health, and this relationship was mediated by the satisfaction of their psychological needs. Ford et al. (2019) found that psychological needs mediated a relationship between supports in the social-organizational

environment and outcomes such as teacher burnout and attrition. Other studies show that psychological needs underlie the relationships between job demands and burnout as well as between job resources and engagement (Fernet et al., 2012; Van den Broeck et al., 2008). These studies uncover the psychological processes that precede teachers' feelings of burnout and intentions to leave their school, and they give us a picture into what types of supports and demands exist in the work environment that activate or diminish these psychological states. This study adds to this repertoire of knowledge by testing a coherent instructional environment as a type of needs support that activates teacher psychological needs and increases the likelihood that they will remain in their school.

It is also worth noting that the variation attributed to faculty trust in colleagues was largely absorbed by instructional program coherence in Model 2, shown in Table 2.4. This may allude to the significant role that leaders play in setting up a coherent instructional environment – establishing a unifying instructional framework, creating structures that allow for collaboration among staff, and vetting adopted programs for congruence with the school's instructional foci (Newmann et al., 2001). It could be that the act of setting a coherent instructional climate also builds faculty trust in school leaders as teachers see that the leaders' actions make clear the expectations and goals for their work, which enables them to better do their jobs. This possible overlapping effect suggests that leaders in coherent schools may simultaneously establish both the organization of the instructional environment and a climate of trust.

Conclusion

The teacher shortage is a problem that has prompted action at the policy level (Ingersoll, 2001; Oklahoma State Department of Education, 2018). In Oklahoma, proposed solutions range from the granting of record numbers of emergency certifications to the emergence of programs

such as Teach for America to a historic pay raise (Oklahoma State Department of Education, 2018). Yet, despite policy action, the teacher exodus continues, and schools are left with a teaching corps that is becoming decreasingly qualified and increasingly unsatisfied with their working conditions (Oklahoma State Department of Education, 2018). Much evidence points to school-level working conditions as the primary predictors of teacher turnover (Allensworth et al., 2009; Boyd et al., 2011; Carver-Thomas & Darling-Hammond, 2017; Guin, 2004; Ingersoll, 2003; Johnson et al., 2012; Ladd, 2011; Loeb et al., 2005; Smith & Ingersoll, 2004; Weiss, 1999), yet it seems that solutions at the school level are scarce. Many working conditions have been linked to teacher attrition, but many of these characteristics of the work environment are not directly tied to the *instructional* environment, which is at the core of teachers' day-to-day work.

To address this gap, this study explored instructional program coherence as a predictor of teacher intent to leave. Results suggest that teachers in schools with higher instructional program coherence are less likely to have intentions of leaving. To understand the psychological processes that explain this relationship, this study also tested teacher psychological needs as a potential mediator in the relationship between IPC and teacher intent to leave. Results suggest that the relationship between IPC and teacher intent to leave operates *through* the satisfaction of teacher psychological needs as the coherence of the instructional environment serves as a type of needs-support. This evidence advances the knowledge on what motivates teachers in their turnover decisions by uncovering the organization of the instructional core as having significant bearing on these decisions. In addition, this study addressed a gap to which several scholars have called attention – the need for explanatory knowledge in the psychological processes that motivate turnover decisions (Fernet et al., 2012).

The evidence presented in this study, coupled with previous studies that draw out the importance of teacher working conditions, seems to paint a story that differs from the focus that motivates policy action. While large-scale policy solutions such as salary increases and recruitment efforts are certainly needed, they are unable to resolve the teacher corps crisis without also repairing the "holes" in the bucket of teacher turnover (Ingersoll, 2002). There is much work to be done at the school level, and school leaders play a significant role in retaining teachers in their school (Podolsky, Kini, Bishop, & Darling-Hammond, 2016). As this study implies, one way that school leaders may retain their faculty is by bringing coherence to the complex and often ambiguous instructional environment. Leaders direct a journey toward coherence by: establishing a common instructional framework; coordinating professional development toward the school's vision for teaching and learning; overseeing the alignment of curricula, assessments, standards, and instructional resources within and across grade levels; providing meaningful feedback that is tied to the instructional framework; vetting new programs and initiatives according to their alignment with the existing vision; and designing school structures that enable collaboration among teachers and leaders that focuses on the school's common vision (Honig & Hatch, 2004; Newmann et al., 2001). Importantly, it seems that a school leader who leads intentional, ongoing coherence-building not only aids in the retention of the teaching corps but also, simultaneously, improves the quality of instruction and overall school effectiveness. Thus, it seems that efforts spent toward coherence are wise investments with fruitful returns.

This study employed the existing measure of instructional program coherence, developed by Newmann and colleagues (2001), which is limited in its ability to comprehensively capture IPC as this study defines it – as having both a structural and cognitive dimension. The existing

measure assesses the structural dimension of IPC, reflected in the coordination of programs, instructional resources, and goals for student learning using a common instructional framework (Newmann et al., 2001). Future research should explore the measurement of the cognitive dimension of instructional program coherence, reflected in the shared mental models of learning that teachers and leaders hold in a particular school (Honig & Hatch, 2004). Measurement of the cognitive dimension would not only enable the assessment of the full definition of IPC, but would also allow for the exploration of how the two dimensions are distinguished in a school that perhaps, for example, has structural coherence in the alignment of resources but does not have cognitive coherence in teachers' shared understandings of instruction.

MANUSCRIPT III

Conceptualization and Measurement of Cognitive Instructional Coherence

Conceptualization and Measurement of Cognitive Instructional Coherence

Instructional program coherence emerged as a measurable construct in the early 2000s through the work of Newmann and colleagues (2001). They discovered through their work in Chicago schools a distinguishing factor among schools with higher student achievement: a coherent instructional environment. Following the initial conceptualization of the construct, early studies found that instructional program coherence was related to higher student achievement and overall school improvement (Bryk et al., 2010; Newmann et al., 2001; Polikoff, 2012; Wonder-McDowell et al., 2011). According to Newmann et al. (2001), instructional program coherence describes an instructional climate where curriculum, assessments, resources, teaching strategies, and school initiatives are aligned within a common instructional framework.

At the core of Newmann's definition is a common instructional framework that guides the alignment of the structural features in the instructional environment. The instructional framework is used to coordinate curricula, standards, and assessments both within and among grade levels (Newmann et al., 2001; Oxley, 2008). It serves as a flexible structure that directs professional learning opportunities – both in how teachers collaborate around issues of teaching and learning and in how professional development sessions are designed around key concepts related to the framework (Firestone et al., 2005; Garet et al., 2001; Jacobson, 2010; Newmann et al., 2001; Youngs & King, 2002). Evaluative feedback that leaders deliver to teachers can be intentionally tied to the framework so that the analysis of lesson plans, use of assessments, appropriateness of instructional materials, and pedagogical methods are not interpreted as isolated parts but are connected through the framework (Newmann et al., 2001; Stosich, 2018; Youngs et al., 2011). In addition, when new programs and initiatives are presented to school

leaders, they vet the programs according to their congruence with the common framework to avoid adopting a collection of disconnected and competing programs (Newmann et al., 2001).

Newmann's (2001) conceptualization and measurement of instructional program coherence captures the structural components essential to a coherent instructional climate. However, looking at coherence solely from a structural lens dismisses the role of human cognition in accomplishing organizational goals (Honig & Hatch, 2004). The alignment of instructional materials and processes is unlikely to reach the instructional core unless teachers, who carry out the daily work of the instructional core, have mental conceptions that allow them to plan and deliver coherent instruction (Honig & Hatch, 2004; Penuel, Fishman, Gallagher, Korbak, & Lopez-Prado, 2009). There is a need to understand how coherence operates not only on a structural level but also on a *cognitive* level, affecting the daily actions of teachers and leaders. Education leadership scholars have called attention to this gap, and researchers in other fields have even tested the coherence of cognition in various work domains (Honig & Hatch; Leithwood, Seashore, Anderson, & Wahlstrom, 2004; Stout, Cannon-Bowers, Salas, & Milanovich, 1999; Van den Bossche, Gijselaers, Segers, Woltjer, & Kirschner, 2011). Despite these advances, cognitive coherence has not yet been conceptualized and measured in a way that reflects the instructional core. The purpose of this study was to 1) conceptualize cognitive instructional coherence; 2) to advance a set of items that measure cognitive instructional coherence; and 3) to test the validity of the new scale.

Defining Cognitive Instructional Coherence

Cognitive coherence moves from structural alignment of an instructional framework into teacher mental associations the underlie teacher assumptions about teaching and learning and pedagogical practices in the classroom. Shulman (2005), in writing about signature pedagogy,

captures the cognitive influence on practice as he distinguishes between surface structures and deep structures of the teaching profession. Surface structures represent the operational, technical day-to-day actions and behaviors of teaching and learning while deep structures are the sets of cognitive assumptions that teachers hold about how best to apply their knowledge (Shulman, 2005). Surface structures, referred to as habits of hand, are shaped by the deep structures, or habits of mind, that are socially constructed by a teaching corps. In building out a definition of cognitive instructional coherence, this study considers the role of deep structures, or the cognitive assumptions of teachers, in bringing coherence to the instructional environment. The definition of cognitive instructional coherence is derived from existing knowledge and scholarship around three elements: mental models, instructional frameworks, and the sharedness of mental models (DeChurch & Mesmer-Magnus; Honig & Hatch, 2004; Newmann et al., 2001; Schwarz & Gwekwerere, 2007; Senge, 2006). For this study, cognitive instructional coherence is defined as the sharedness among mental models teachers hold about a shared instructional framework in a school.

Mental Model of the Instructional Framework

Mental models are cognitive structures that exist in the minds of individuals and that represent concepts, ideas, processes, or phenomena (Ericsson & Pool, 2016; Leithwood et al., 2004). In the work setting, employees hold mental models of job tasks, team responsibilities, expectations, goals and objectives, and the use of resources (Johnson, Lee, Lee, O'Connor, Khalil, & Huang, 2007; Langan-Fox, Wirth, Code, Langfield-Smith, & Wirth, 2001; Matteson, 2015). Mental models not only shape how employees "see" and make sense of their environment but also how they act and make decisions in their roles (Senge, 2006). Leithwood et al. (2004) describes them as "cognitive maps" that "serve as guides to making both big and little decisions"

(p. 65). Because of this, the individual mental models of employees have long been a concern of leadership experts since employees make the daily decisions that carry out the goals of the organization (Spillane, Reiser, & Reimer, 2002).

In schools, teachers are the employees who make daily decisions that carry the school's vision for teaching and learning into their respective classrooms (Cohen & Ball, 1999; Hattie, 1992). Mental models are foundational to cognitive coherence in a school because these models shape how teachers think, how they see elements of the instructional environment, and ultimately, how they act. Cognitive coherence in schools relies on a common instructional framework as the mental model that aligns teachers' daily work to the school's overall vision for teaching and learning. Newmann and colleagues (2001) define an instructional framework as a framework that "specifies expectations for student learning with specific strategies and materials to guide teaching and assessment" (p. 299). The framework is not tied to one particular curricular program but rather provides a unifying framework through which learning materials, teaching strategies, and expectations for student learning are organized (Newmann et al., 2001; Oxley, 2008; Youngs et al., 2011). Schwarz and Gwekwerere (2007) describe an instructional framework as a "simplified representation of the process one might engage in and the content one might address while teaching" (p. 159). Essentially, an instructional framework is a cognitive representation of the "what" and the "how" of teaching and learning in a particular school.

One example of a common instructional framework is Balanced Literacy. Elements of the framework include read aloud, shared reading, guided reading, interactive writing, independent reading and writing, and word work (Bingham & Hall-Kenyon, 2013). The elements are intended to work together to position instruction along a gradual release of responsibility continuum that

leads from teacher modeling to guided practice to student independent practice (Bingham & Hall-Kenyon, 2013). For example, during a read aloud, the teacher assumes much of the responsibility as she reads a book aloud to students and engages them in critical dialogue about the book. During shared reading, students read aloud chorally along with the teacher. In guided reading, students read independently as the teacher offers support. During independent reading, students read on their own without teacher support. Subject area content and standards for student learning are integrated through these literacy elements (read aloud, shared reading, interactive writing, etc.) so that students have opportunities to make meaningful connections across content areas while simultaneously developing literacy skills (Velasco, 2012). Using this framework, teachers organize units and lessons within these elements and are able to see how content is meaningfully integrated.

Suppose a second grade teacher using the Balanced Literacy Framework is planning a science unit on the concept of erosion. As the teacher approaches the planning process, he identifies the science learning standards he plans to address and begins to work backwards from the end goal. He plans the unit by pulling together curricula to design activities that fall within each of the Balanced Literacy elements. He intentionally selects shared reading texts that are focused on the topic of erosion. In addition to using the text as an opportunity to front-load information about erosion, he plans to have students draw out features of a non-fiction text as well as analyze "ea" vowel patterns that they have been working on in guided reading and word work groups. He also selects read aloud texts that cover the concept of change and engages students in a critical discussion about how the concept of change connects to the causes and effects of erosion. For writing, the teacher plans an interactive writing lesson in which they construct a "how-to" article about types of erosion prevention. He plans to cover standards that

focus on the mode of writing ("how-to" writing) and writing conventions (i.e. punctuation, capitalization, sentence structure). He plans a culminating project in which students will model and test a form of erosion control using sand and water. They will sketch and write a rationale for their plan. He will use this project as a form of assessment.

In this example, the Balanced Literacy Framework operates as a mental model that allows the teacher to pull together and make sense of multiple sets of information – curricula, content standards, and assessments; identify what is most relevant; and organize these elements toward coherent instruction. In the face of a complex instructional environment in which teachers are often overwhelmed by mass information, a common instructional framework brings clarity to the instructional task, allows teachers to filter through multiple sources of information, and enables them to identify how parts of their job fit together as a meaningful unit (Honig & Hatch, 2004; Schwarz & Gwekwerere, 2007). Instructional frameworks serve as cognitive tools for planning and teaching lessons that help teachers "attend to the most important components" (Schwarz & Gwekwerere, 2007, p. 161). Honig and Hatch (2004) found that coherent organizations used these cognitive frameworks, which they refer to as simplification systems, to bring clarity and organization to a complex and noisy work environment. Shulman (2005) argues that as teachers learn how to do complex things in a routine manner, it frees up time, cognitive space, and energy to focus on increasingly complex matters. As demonstrated in the example of the Balanced Literacy Framework, instructional frameworks simplify the teaching task and provide flexible structure that "help organizational actors behave confidently in the face of complexity and ambiguity" (Honig & Hatch, 2004, p. 20) and that "make novelty tolerable" (Shulman, 2005, p. 56).

This study conceptualizes an instructional framework as a mental model that functions not only on a structural level but also on a cognitive level (Honig & Hatch, 2004). Knowing that mental models shape action, it makes sense that a common instructional framework, when functioning on a cognitive level, would bring coherence to individual classrooms within a school. But the work of teachers within a school is collective, dynamic, and greater than the sum of individual parts (Darling-Hammond & Bransford, 2007). The process of building cognitive coherence in a school is social in nature and requires the collective construction of mental models that are not individual to each teacher but rather *shared* among the teaching corps (Honig & Hatch, 2004). Thus, the final component of Cognitive Instructional Coherence pertains to the sharedness of teacher mental models.

Sharedness of Mental Models

Previously stated, evidence suggests that employees have mental models that guide their actions in the workplace ((Johnson, Lee, Lee, O'Connor, Khalil, & Huang, 2007; Langan-Fox et al., 2001; Matteson, 2015). As 21st organizations face increasingly complex problems and have continued to shift toward more interdependent, collaborative work environments, research attention has extended beyond *individual* mental models to *shared* mental models (Leithwood et al., 2004; Stout et al., 1999; Van den Bossche et al., 2011). Shared mental models are defined as the extent to which members of a group hold a similar mental framework or cognitive representation of a concept or phenomenon (Langan-Fox et al., 2001; Matteson, 2015). It makes sense that if employee actions are guided by their mental models, coherence among mental models would support coordinated effort and performance across the organization. In fact, several studies suggest that when there is sharedness among employee mental models related to the job task, organizations experience more efficient team processes and higher performance

(DeChurch & Mesmer-Magnus, 2010; Zhou & Wang, 2010; Lim & Klein, 2006; Mathieu, Heffner, Goodwin, Salas, & Cannon-Bowers, 2000; Stout et al., 1999; Van den Bossche et al., 2011). Organizations often set a clear direction, allocate resources to accomplish the goals, and rally team members to carry out the vision. As Senge (2006) argues, however, the best visions that have the greatest potential to move organizations forward will likely fail unless leaders are able to influence the "pictures of reality" held by those who make day-to-day decisions in the organization.

Situating this knowledge within the context of schools, which rely on coordination and collective effort among teachers and leaders (Darling-Hammond & Bransford, 2007), it makes sense that sharedness among the mental models of teachers would bring coherence to the teaching and learning climate. Cohen and Ball (1999) suggest that many instructional improvement efforts fail to alter teaching and learning because they neglect the mediating role of collective teacher understanding in affecting what occurs in classrooms. For example, the ability of high-quality curricula to enhance schoolwide learning outcomes is contingent upon teachers' shared understanding of how to make sense of curricular goals, take inventory of student needs, determine how to use the materials to meet those unique needs, and embed assessment that will inform further teaching and learning (Darling-Hammond & Bransford, 2007).

Scholars have called attention to the need for professional norms that are both specifically related to teaching and learning and that are shared rather than individualistic (Cohen & Ball, 1999). As teachers approach the daily task of planning and delivering instruction, they rely on their mental models as a filter through which they make sense of curricula, assessments, standards, and student needs (Bruer, 1993; Ericsson & Pool, 2016; National Research Council, 2000). These models not only determine what they see and how they make sense of their task,

but they also inform their courses of action (Cohen & Ball, 1999; Ericsson & Pool, 2016; National Research Council, 2000). To accomplish instructional coherence in a given school, teachers need to have a shared mental model of how they "see" the instructional core.

Schwarz and Gwekwerere (2007) argue that a common instructional framework has the potential to shape teacher orientations in how they approach the teaching and learning environment. Further, this process of shaping mental models is not one that is passive or individual but is rather a process that is both active and collective (Honig & Hatch, 2004; Schwarz & Gwekwerere, 2007). The process of building coherence is not solely determined by the "objective alignment" of organizational structures, resources, and learning materials. Rather, it is a social construction that involves teachers and leaders engaging in an ongoing and dynamic process of "crafting" coherence among the structures, materials, resources, and people in the organization (Honig & Hatch, 2004). These social interactions, guided by the common instructional framework, position teachers and leaders within a continual sensemaking process that influences their mental conceptions – how they "see" their work environment (Honig & Hatch, 2004). Schwarz and Gwekwerere (2007) describe the role of a common instructional framework in the social construction of coherence:

> "Instructional frameworks can play an important role in social learning within a community, helping to provide a concrete representation and direction for teaching and learning that can be reflected on, argued against, and applied in specific teaching situations. Such social construction of knowledge around a framework and application toward teaching may be one of the most useful and productive functions of teaching and learning frameworks" (p. 162).

In practice, an instructional framework serves as a platform for teacher collaboration and conversation and a channel through which teachers develop common language, reflective dialogue about teaching practice, shared goals and expectations for student learning, and a common understanding of how instructional materials should be used. The framework becomes a social and cognitive infrastructure that organizes collective teacher learning which then serves as a vehicle through which organizational learning moves the school forward toward its goals. In sum, cognitive instructional coherence emerges as teachers build shared mental models around the common instructional framework.

Scale Development

The development of the Cognitive Coherence Scale was built upon a nomological network grounded in the areas of mental models, instructional frameworks, and the sharedness of mental models (DeChurch & Mesmer-Magnus, 2010; Honig & Hatch, 2004; Newmann et al., 2001; Schwarz & Gwekwerere, 2007; Senge, 2006). The proposed structure of instructional program coherence as having two interdependent components emerges from the work of Newmann and colleagues (2001) and Honig and Hatch (2004). The original items measuring instructional program coherence, advanced by Newmann (2001), are used to capture structural coherence. These items are presented in Table 3.1.

Table 3.1

Measure of Structural Coherence (Original IPC Scale)

1.	The programs in this school are implemented carefully.
2.	Once we start a new program, we follow up to make sure that it is working.
3.	The programs in this school are meaningful and effective for our students.
4.	You can see real continuity from one program to another at this school.
5.	Curriculum, instruction, and learning materials are coordinated across the different grade levels at this school.
6.	There is consistency in curriculum, instruction, and learning materials among teachers in the same grade level at this school.

Note. Initial measure of Instructional Program Coherence (Newmann et al., 2001), which this study conceptualizes as the structural dimension of IPC. Items were measured using a 6-point Likert scale with a range as follows: Strongly Disagree, Disagree, Somewhat Disagree, Somewhat Agree, Agree, Strongly Agree.

New items were created to address cognitive instructional coherence, the construct of particular interest in this study. Each statement begins with the item stem, "In this school, teachers have a shared image in their minds of…" This purpose of this stem was to direct respondent attention toward the common referent among the items – teachers in their school. Because the items intend to measure the coherence, or "sharedness," of teacher mental representations, the wording "shared image in their minds" was intentionally chosen to capture not individual mental representations of teachers but rather the commonality of mental representations among teachers. This wording was informed by the theoretical knowledge on mental representations as images in our minds that represent concepts, ideas, or phenomena (Ericsson & Pool, 2016; Langan-Fox et al., 2001).

The remaining portion of the items was derived from understanding of an instructional framework (Newmann et al., 2001; Schwarz & Gwekwerere, 2007). Recall that an instructional framework has been defined as a "simplified representation of the process one might engage in

and the content one might address while teaching" (Schwarz & Gwekwerere, 2007, p. 159). It is a unifying structure that specifies expectations for student learning with specific strategies and materials to guide teaching and assessment (Newmann et al., 2001). In designing a scale to measure the sharedness of teacher mental models of a common instructional framework, items were written to address key components of this framework. Because the scale seeks to capture only the coherence among mental models, rather than the mental models themselves, items were constructed at a general level so that the scale might be used across schools with varying frameworks. Items are listed in Table 3.2. A 6-point Likert scale was used for all items, allowing for the following distinctions in responses: 1 –Strongly Disagree; 2 – Disagree; 3 – Somewhat Disagree; 4 – Somewhat Agree; 5 – Agree; 6 – Strongly Agree.

The first two items were written to capture the *general* sharedness of how teachers "see" teaching and learning:

1. In this school, teachers have a shared image in their minds of what learning looks like.
2. In this school, teachers have a shared image in their minds of what good teaching looks like.

At the core of the learning environment is how teachers interact with students – how they motivate students, the expectations they have for student learning, the ways they address student misbehavior, and how they deliver feedback to students (Bruer, 1993; Cohen & Ball, 1999; Darling-Hammond & Bransford, 2007). Items 3, 6, 7, and 8 address the sharedness of teacher perceptions of these teacher-student interactions:

3. In this school, teachers have a shared image in their minds of how to motivate students.

6. In this school, teachers have a shared image in their minds about expectations for student learning.

7. In this school, teachers have a shared image in their minds of how to address student misbehavior.

8. In this school, teachers have a shared image in their minds about how to deliver useful feedback to students.

The way that teachers see instructional materials influences how they plan, deliver, and adjust instruction (Cohen & Ball, 1999; Penuel et al., 2009). The ways that teachers interpret and use instructional materials mediate the ability of those materials to influence student learning (Cohen & Ball, 1999; Darling-Hammond & Bransford, 2007). Items 4 and 5 address teacher use of both curriculum and assessments:

4. Teachers in this school have a shared image in their minds of how to use curriculum to plan purposeful instruction.

5. Teachers in this school have a shared image in their minds of how to use assessments intentionally to support student growth.

Table 3.2

Original Items Measuring Cognitive Instructional Coherence

1. In this school, teachers have a shared image in their minds of what learning looks like.
2. In this school, teachers have a shared image in their minds of what good teaching looks like.
3. In this school, teachers have a shared image in their minds of how to motivate students.
4. In this school, teachers have a shared image in their minds of how to use assessments intentionally to support student growth.

5. In this school, teachers have a shared image in their minds of how to use curriculum to plan purposeful instruction.

6. In this school, teachers have a shared image in their minds about expectations for student learning.

7. In this school, teachers have a shared image in their minds of how to address student misbehavior.

8. In this school, teachers have a shared image in their minds about how to deliver useful feedback to students.

Note. Items were measured using a 6-point Likert scale with a range as follows: Strongly Disagree, Disagree, Somewhat Disagree, Somewhat Agree, Agree, Strongly Agree.

Method

Data were collected in the spring of 2019 as part of a larger research endeavor measuring school climate conditions through the survey of students, teachers, administrators, and parents. Surveys used in this study were administered to teachers in one large urban district and one large suburban district in a Southwestern city of the United States. The sample included teachers from 40 schools within two districts with student enrollments of approximately 16,000 and 19,000 respectively. Schools in the first district had an average free and reduced lunch rate of 66.9 with an average of 71.7 percent of students identifying as a minority racial group. Schools in the second district had an average free and reduced lunch rate of 42.9 percent with an average of 41.3 percent of students identifying as a minority racial group. Survey constructs were split into two distinct surveys. Teachers either received Form A or Form B of the survey. Instructional program coherence items appeared on both forms. Participation in the survey was voluntary, and teachers received an email with a link to the survey. Responses were deidentified of personal information to maintain anonymity.

For the first district, a total of 808 teachers received the survey, and 522 completed the survey, yielding a 65 percent response rate. For the second district, a total of 1,170 teachers received the survey, and 607 completed the survey, yielding a 52 percent response rate. After deleting cases in which instructional program coherence items were left blank, a total sample of 975 teachers remained. Items were measured using a 6-point Likert scale ranging from *strongly disagree* (1) to *strongly agree* (6). Teachers had an average tenure of 12.4 years in teaching and 6.0 years in their current school. Eighty-six percent of teachers identified as female, and 10 percent obtained National Board Certification.

Content Validity

After the cognitive coherence items were drafted, they were presented to a team of experts and researchers in educational leadership. Based on their feedback, language substitutions and omissions were made in order to increase both the clarity of items and the ability of the cognitive items to comprehensively represent the key aspects of the instructional core. Items were omitted when it was discovered that more than one item addressed the same aspect of the instructional core, for example, using appropriate methods of assessment. Next, the revised items were presented to several classroom teachers. Without knowing what the items intended to measure, teachers were asked to review the items and describe what they thought the set of items were meant to address overall. Then they were asked to describe their initial thoughts about what each individual item captured. Their descriptions revealed face validity among items, as their initial thoughts about the items were aligned with the phenomenon each item sought to capture. Based on teacher feedback, the ambiguous wording of one item was revised to increase clarity.

Structural Validity

A construct like instructional program coherence is a phenomenon that cannot be directly observed, and thus, must be measured indirectly as a latent factor made up of observable variables (Byrne, 2005; Schreiber, Nora, Stage, Barlow, & King, 2006). The conceptualization of a latent factor assumes that the latent condition has a theoretical effect on the observed variables (Schreiber et al., 2006). Factor analysis is used to evaluate the structural validity of the latent construct by examining the relationship between the latent variable and the observed variables (Bryne, 2005; Messick, 1995). Exploratory factor analysis (EFA) is preferred when the proposed measure is developed without theoretically-derived assumptions about how the observed variables may converge onto factors (Bryne, 2005). Confirmatory factor analysis (CFA) is the most applicable method when the proposed measure has been constructed a priori – meaning the researcher uses an existing theoretical model or empirical evidence to create the items according to a predetermined structure (Bryne, 2005). In the development of the Cognitive Instructional Coherence scale, items were written with a theoretical model in mind. However, as Bryne (2005) argues, EFA is still an appropriate initial step in the development of a new assessment measure.

Because the cognitive dimension of coherence has not yet been measured, this study first explored factor structure using two Exploratory Factor Analyses to 1) test whether or not the cognitive items load onto one factor and 2) to determine whether the cognitive items load onto a distinct factor when all items – both structural and cognitive – are analyzed simultaneously. The study sample was split into two smaller samples; the first split sample was comprised of survey data from teachers in district one, and the second split sample was comprised of data from district two. To avoid confirmation of bias from the same data set, both EFA were carried out

using the first split sample, and a CFA was conducted using the second split sample (Cabrera-Nguyen, 2010).

Exploratory factor analyses (EFA) were conducted in SPSS 24 using principal axis factoring extraction method. Sample adequacy was assessed using the Kaiser-Meyer-Olkin Measure of Sampling Adequacy and Bartlett's test of sphericity. The first EFA, analyzing only the cognitive items, used principal axis factoring without rotation. The second EFA, analyzing both the cognitive and structural items simultaneously, employed principal axis factoring using the Promax rotation method with Kaiser normalization in order to simplify the reporting and interpretation of the factor structure. Rotating the data allows the values to fall closer to the axes, thus reporting a more clear delineation of the distinct factors (Osborne, 2015). An oblique rotation method was used because the factors are assumed to be correlated given that both sets of items are theorized to measure a form of instructional coherence in schools (Costello & Osborne, 2005). For both Exploratory Factor Analyses, the number of factors was determined 1) by evaluating the number of factors with eigenvalues greater than 1.0 and 2) by examining a scree plot to determine how many data points exist above the natural "break" in the curve of the data (Costello & Osborne, 2005). Factor loadings above .40 were assumed to be significant (Costello & Osborne, 2005).

After gaining an initial understanding of the item structure, a CFA was used to empirically test the theoretical structure of the cognitive coherence items. A first-order model of the eight items that comprise the proposed Cognitive Instructional Coherence Scale was tested using Mplus 8.4 with Maximum Likelihood Estimation. Parameter estimates were used to assess the extent to which each item mapped onto the construct. A collection of model fit indices was used to evaluate the extent to which the theoretically derived model matches the structural

relationship among the variables. Based on recommendations of several authors, absolute fit was measured using the Root Mean Square Error of Approximation (RMSEA) and the Standardized Root Mean Square Residual (SRMR) (Kline, 2005; Schreiber et al., 2006). The RMSEA and SRMR are similar in nature, but many have argued that the RMSEA has the potential to produce a false reporting of poor model fit when the model contains low degrees of freedom (Kenny, Kaniskan, & McCoach, 2014). Since this model has low degrees of freedom, the RMSEA was used in conjunction with the SRMR. Relative fit was assessed using the Tucker Lewis Index (TLI) and the Comparative Fit Index (CFI) (Klein, 2005; Schreiber et al., 2006). While the Chi-Square value is a popular index for Confirmatory Factor Analyses, it is sensitive to sample size (DiStefano & Hess, 2005). Given the large size of the study sample, this index was not used to evaluate model fit.

Structural validity will be assumed should the following conditions be present: 1) results of the EFA reveal that the items intended to measure cognitive coherence load onto a distinct factor and 2) goodness-of-fit indices indicate that the final model maintains good fit according to the following criteria: a comparative fit index (CFI) ≥ 0.95, a Tucker-Lewis index (TLI) ≥ 0.95, a root mean square error of approximation (RMSEA) ≤ 0.08, and a standardized root mean square residual (SRMR) ≤ 0.08 (Hu & Bentler 1998; Schermelleh-Engel et al. 2003).

Convergent Validity

Convergent validity was assessed in order to test the extent to which Cognitive Instructional Coherence correlates with another construct that is theoretically similar (Hinkin, 1998). Convergent validity was tested by evaluating the correlational relationship between cognitive instructional coherence and collective teacher efficacy. Goddard, Hoy, and Hoy (2000) define collective teacher efficacy as the “perceptions of teachers in a school that the efforts of the

faculty as a whole will have a positive effect on students" (p. 480). While teacher self-efficacy is associated with an individual teacher's perception of his or her own capability to achieve certain outcomes, *collective* teacher efficacy is concerned with the perception of shared capability of a teaching corps within a particular school (Goddard et al., 2000). When teachers make judgments about the collective efficacy of the teaching corps, they evaluate the level of difficulty of the teaching task in relation to their perceptions of group competence. In evaluating the teaching task, teachers consider what defines good teaching in their particular school, the challenges that might obstruct teaching success, and school resources available to support quality teaching (Goddard et al., 2000).

The information teachers use to make these judgements emerges from four sources nested within the school environment: mastery experiences, vicarious experiences, social persuasion, and affective states (Bandura, 1999). At the organizational level, mastery experiences support development of collective teacher efficacy as teachers have opportunities to share and experience success with colleagues as well as learn from and develop a collective sense of resilience when faced with difficulties (Goddard et al., 2000). Vicarious experiences inform collective efficacy beliefs as teachers hear stories of colleague success in the classroom (Goddard et al., 2000). Social persuasion operates as a source for collective efficacy beliefs as teachers engage in conversations about teaching and learning with colleagues, participate in professional development opportunities, and share reflective dialogue that provides informative feedback for instruction (Goddard et al., 2000). The fourth source of efficacy, affective states, refers to how organizations respond to challenges, buffer pressures, and maintain stability in the face of disruption (Goddard et al., 2000).

Collective teacher efficacy and cognitive instructional coherence share a foundational premise – both shape and are shaped by normative conditions within the school context (Goddard et al., 2000; Honig & Hatch, 2004). Both constructs are socially and cognitively constructed as the "product(s) of the interactive dynamics of the group members" (Goddard et al., 2000, p. 428). In a school with a highly efficacious teaching corps, a sense of organizational agency enables teachers to act purposefully in pursuing organizational goals and enhancing student learning (Goddard et al., 2000). Teachers, as a collective body, develop the ability to self-regulate, to monitor their own ability to accomplish organizational goals, and to adapt to new challenges (Goddard et al., 2000). Within a school with high cognitive coherence, a shared mental model of the common instructional framework delineates how teacher efforts should bring about desired goals for student learning. The framework operates as a simplification system that brings clarity to their role as instructor and designates how the parts of their job fit together (Honig & Hatch, 2004). It makes sense that this framework would enable teacher success, and as they share these successes with colleagues, these mastery experiences would affect collective teacher efficacy beliefs.

Within coherent schools, ongoing teacher reflection, collaboration, and shared learning around a common instructional framework may provide a platform for teachers to build efficacy through vicarious experiences. The framework serves as a social and cognitive channel through which teachers share teaching successes and failures. For example, when teachers in a school using Balanced Literacy share the success of a guided reading lesson, colleagues are able to understand and relate to the teacher's experience as they filter the account through the shared mental model and common language they have built around the framework. Similarly, it is reasonable that in these settings, social persuasion would occur as teachers and leaders engage in

reflective dialogue and provide valuable feedback that is tied to the common framework. In fact, Goddard et al (2000) argues, "The more cohesive the faculty, the more likely the group as a whole can be persuaded by sound argument" (p. 484). Finally, as a teaching corps within a coherent school faces new teaching challenges or demands, teachers are able to adjust to novel problems, maintain stability in uncertain situations, and "behave confidently in the face of complexity and ambiguity" because their shared mental model of the common framework provides the flexible structure they need to adapt (Honig & Hatch, 2004). These habits of mind "make novelty tolerable and surprise sufferable" (Shulman, 2005, p. 56). This sense of collective resilience that teachers develop would support their sense of collective efficacy that is informed by affective states.

Convergent validity was also tested by examining the correlational relationship between the cognitive and structural items. One would expect the items to be moderately to strongly correlated since they both capture a component of instructional coherence in schools. At the same time, the correlation should be modest enough to demonstrate that the two scales are distinct and measure unique phenomena. Instrument reliability was tested by calculating a Chronbach's alpha value for both the set of structural items and the set of cognitive items.

Results

Structural Validity

EFA 1

The first EFA analyzed only the cognitive coherence items to explore the structure of these items. Results from the Kaiser-Meyer-Olkin Measure of Sampling Adequacy revealed a value of 0.930, confirming that the distribution of values was adequate for proceeding with factor analysis and suggesting that the variables were correlated in a way that made them well-suited

for factoring (Kaiser, 1970). Bartlett's Test of Sphericity produced a significant value (p=.000) less than .05, indicating a high probability that relationships exist among the variables (Bartlett, 1950). Given the results of these two tests (see Table 3.3), factor analysis was deemed appropriate for this data (Bartlett, 1950; Kaiser, 1970).

Table 3.3

Results for KMO and Bartlett's Test of Sphericity – EFA 1

Test		Value
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.930
Bartlett's Test of Sphericity	Approx. Chi-Square	3512.209
	df	28
	Sig.	.000

Results from the first EFA, presented in Table 3.4, revealed that the observed variables converged onto one factor with an eigenvalue of 5.8. Factor 1, comprised of all eight cognitive coherence items, explained 72.8 percent of the variance with factor loadings ranging from .756 to .862. By several standards of evaluation (Comrey & Lee, 1992; DiStefano & Hess, 2005; Hulland, Chow, & Lam, 1996; Osborne & Costello, 2009), the strength of factor loadings were excellent in assuming the items cohere around one distinct factor. The scree plot, presented in Figure 3.1, shows one factor with an eigenvalue value above 1.0, and the curve of the line begins to break below the first factor, supporting the conclusion that data converge onto one distinct factor.

Table 3.4

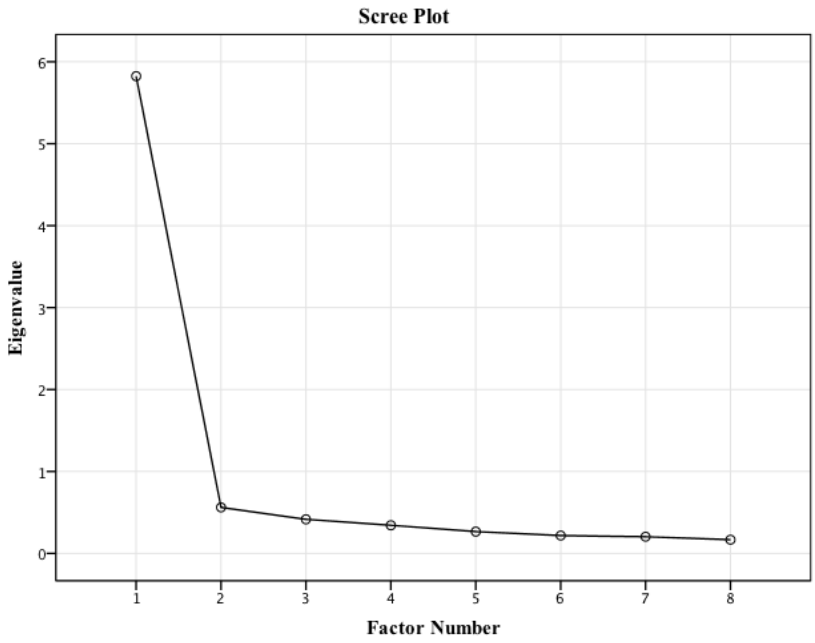
Results of Exploratory Factor Analysis 1

Item	Factor 1	Dimension
In this school, teachers have a shared image in their minds of what learning looks like.	**.821**	Cognitive
In this school, teachers have a shared image in their minds of what good teaching looks like.	**.852**	Cognitive
In this school, teachers have a shared image in their minds of how to motivate students.	**.840**	Cognitive
In this school, teachers have a shared image in their minds of how to use assessments intentionally to support student growth.	**.860**	Cognitive
In this school, teachers have a shared image in their minds of how to use curriculum to plan purposeful instruction.	**.803**	Cognitive
In this school, teachers have a shared image in their minds about expectations for student learning.	**.862**	Cognitive
In this school, teachers have a shared image in their minds of how to address student misbehavior.	**.756**	Cognitive
In this school, teachers have a shared image in their minds about how to deliver useful feedback to students.	**.844**	Cognitive

Notes. Extraction Method: Principal Axis Factoring. Loadings larger than 0.40 are in bold.

Figure 3.1

Scree Plot for EFA 1



EFA 2

The second EFA explored the structure of the cognitive coherence items by testing whether or not they map onto their theoretically derived factor when combined with the items that measure structural coherence. The cognitive items intend to measure a different component of coherence in schools than the structural items, so it is hypothesized that items would cohere around these two factors. Results from the Kaiser-Meyer-Olkin Measure of Sampling Adequacy revealed a value of 0.935, confirming that the distribution of values was adequate for proceeding with factor analysis and suggesting that the variables were correlated in a way that makes them well-suited for factoring (Kaiser, 1970). Bartlett's Test of Sphericity produced a significant value ($p = .000$) less than .05, indicating a high probability that relationships exist among the variables (Bartlett, 1950). Given the results of these two tests (see Table 3.5), factor analysis was deemed appropriate for this data (Bartlett, 1950; Kaiser, 1970).

Table 3.5

Results for KMO and Bartlett's Test of Sphericity

Test		Value
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.935
Bartlett's Test of Sphericity	Approx. Chi-Square	6251.989
	df	91
	Sig.	.000

Results from the EFA, presented in Table 3.6, revealed that the observed variables converged onto two factors, having Eigenvalues of 8.3 and 1.9. Factor 1 was comprised of the first 8 items that sought to capture the cognitive component of coherence. These 8 items explained 59.3 percent of the variance with factor loadings ranging from .705 to .861. Factor 2 was comprised of the remaining 6 items that purported to measure the structural component of coherence. These 6 items explained 13.7 percent of the variance with factor loadings ranging from .547 to .904. The strength of factor loadings for both Factor 1 and Factor 2 are sufficient, and in most cases, excellent in assuming the items cluster around their theoretically derived factor (Comrey & Lee, 1992; DiStefano & Hess, 2005; Hulland et al., 1996); Osborne & Costello, 2009). The scree plot, presented in Figure 3.2, shows two factors with values above 1.0, and the curve of the line begins to break below the second factor, supporting the claim that data converge onto two distinct factors.

Table 3.6

Results of Exploratory Factor Analysis 2

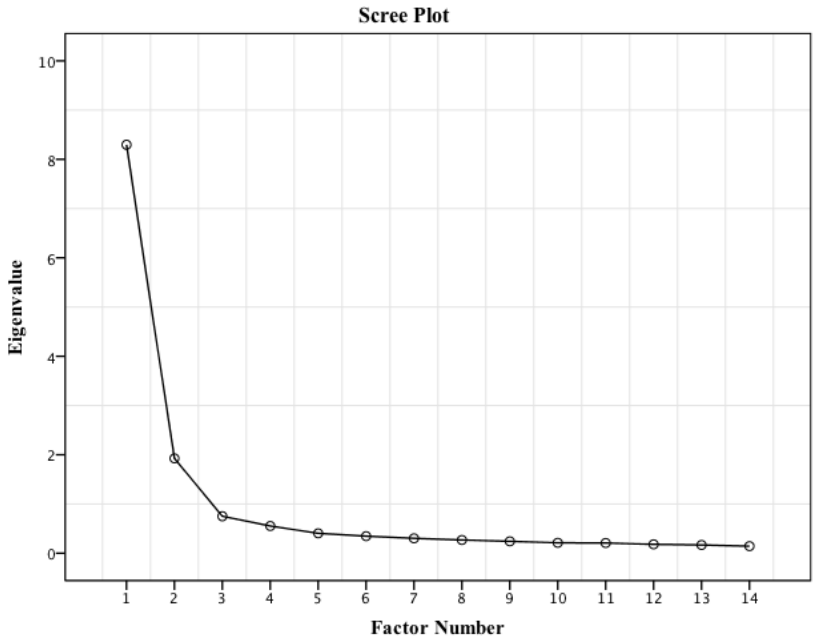
Item	**Factor**	**Dimension**

	1	2	
In this school, teachers have a shared image in their minds of what learning looks like.	**.795**	.042	Cognitive
In this school, teachers have a shared image in their minds of what good teaching looks like.	**.859**	-.013	Cognitive
In this school, teachers have a shared image in their minds of how to motivate students.	**.839**	.000	Cognitive
In this school, teachers have a shared image in their minds of how to use assessments intentionally to support student growth.	**.857**	.005	Cognitive
In this school, teachers have a shared image in their minds of how to use curriculum to plan purposeful instruction.	**.772**	.054	Cognitive
In this school, teachers have a shared image in their minds about expectations for student learning.	**.861**	.003	Cognitive
In this school, teachers have a shared image in their minds of how to address student misbehavior.	**.705**	.083	Cognitive
In this school, teachers have a shared image in their minds about how to deliver useful feedback to students.	**.859**	-.021	Cognitive
The programs in this school are implemented carefully.	-.016	**.854**	Structural
Once we start a new program, we follow up to make sure that it is working.	-.036	**.887**	Structural
The programs in this school are meaningful and effective for our students.	-.029	**.892**	Structural
You can see real continuity from one program to another at this school.	-.012	**.904**	Structural
Curriculum, instruction, and learning materials are coordinated across the different grade levels at this school.	.131	**.701**	Structural
There is consistency in curriculum, instruction, and learning materials among teachers in the same grade level at this school.	.178	**.547**	Structural

Notes. Extraction Method: Principal Axis Factoring. Rotation Method: Promax with Kaiser Normalization. Loadings larger than 0.40 are in bold.

Figure 3.2

Scree Plot for EFA 2

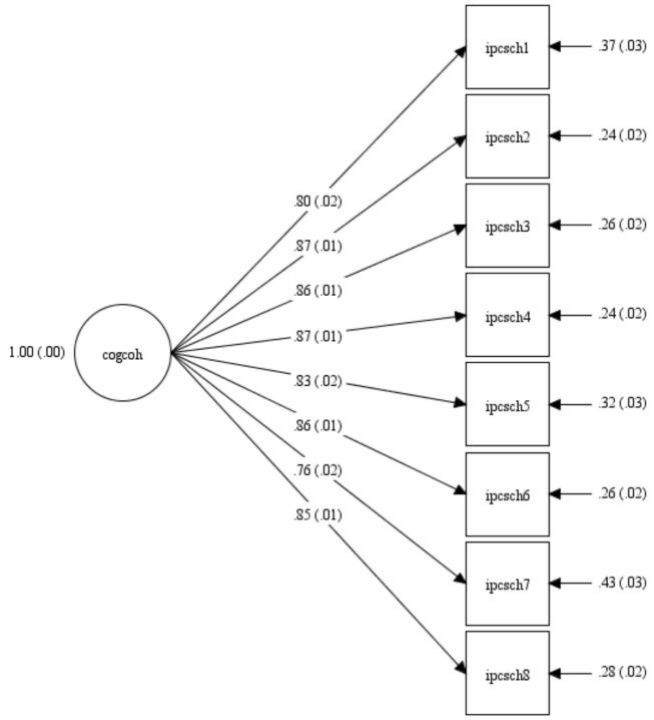


CFA

After gaining initial evidence and understanding of the structure of the cognitive coherence items, a CFA was used to empirically test this structure using the second split sample. Results of the final model confirmed that the hypothesized and theoretically derived first-order model was an adequate fit. The first iteration, however, produced a RMSEA value that indicated mediocre fit (RMSEA = .15) (Table 3.7, Figure 3.3). A post-hoc analysis was conducted in order to specify the model according to theoretical reasoning and statistical modifications.

Figure 3.3

First-Order Model (Original Model) for Cognitive Instructional Coherence



Note. IPCsch = Cognitive Instructional Coherence items.

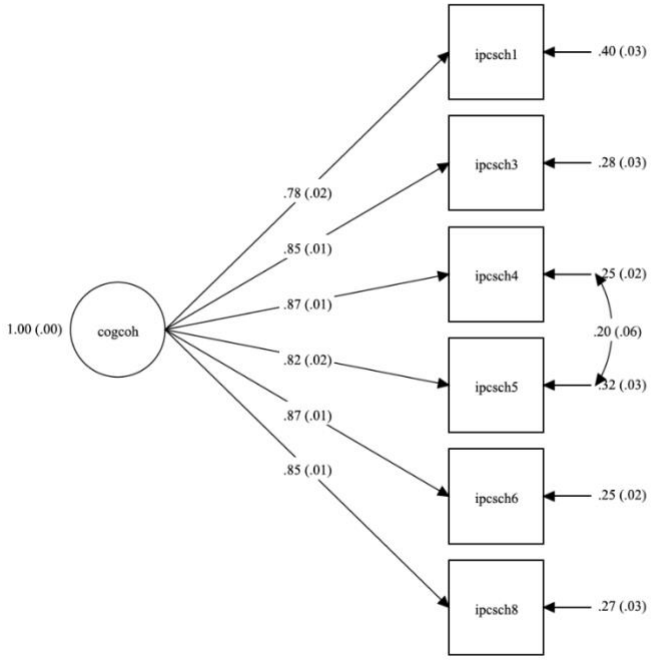
Modification indices revealed that Item 7 (“Teachers in this school have a shared image in their minds about how to address student misbehavior”) did not adhere as strongly as the others items. Theoretically, it made sense that Item 7 would act as an outlier, considering all of the other items captured elements specific to teaching and learning. Student behavior, while proximal to the learning environment, is typically not explicitly addressed within a common instructional framework. Upon this theoretical reasoning, Item 7 was removed. In addition, it seemed that Item 1 (“Teachers in this school have a shared image in their minds of what learning looks like”) and Item 2 (In this school, teachers have a shared image in their minds of what good teaching looks like”) were highly correlated. Teachers may interpret these items similarly since they are both worded more generally than the other items, and they both capture a general perception of the instructional environment. Most teachers would consider teaching and learning

to be interrelated, and some may even find them difficult to separate. For this reason, Item 2 was removed. As a final modification, residuals were correlated for Item 4 ("Teachers in this school have a shared image in their minds of how to use assessments intentionally to support student growth") and Item 5 ("Teachers in this school have a shared image in their minds of how to use curriculum to plan purposeful instruction"). It seems that covariance existed between these items and that together they may be measuring some other extraneous phenomenon (Gerbing & Anderson, 1984). This is plausible given that both items capture teacher perceptions of instructional materials. Fornell (1983) and Bagozzi (1983) argue that one should proceed with correlating errors only when the following conditions are met: 1) the correlation is theoretically warranted; and 2) the correlation of errors does not significantly alter the parameter estimates. Since both criteria are met, errors for Items 4 and 5 were correlated.

After the abovementioned modifications were specified (Figure 3.4), model fit improved (CFI = .99; TLI = .98; RMSEA = .07; SRMR = .02). Results appear in Table 3.7. The RMSEA value (RMSEA = .07) suggests a good model fit under several cutoff standards (Hooper, Coughlan, & Mullen, 2008; MacCallum, Browne, & Sugawara, 1996; Steiger, 2007). Others suggest a .05 or .06 cutoff value, but most scholars agree that not only are RMSEA cutoff values arbitrary, but they are also sensitive to sample size and degrees of freedom (Hu & Bentler, 1998; MacCallum et al., 1996). Consequently, it is recommended that RMSEA be evaluated in conjunction with other model fit indices (Bollen & Long, 1993; Hu & Bentler, 1998; MacCallum et al., 1996). Both the CFI (CFI = .99) and TLI (TLI = .98) values were above the .95 threshold that indicates a good fitting model (Brown, 2006; Hu & Bentler, 1998; Schreiber et al., 2006). In addition, the SRMR value (SRMR = .02) is less than the .08 threshold and indicates good fit (Brown, 2006; Hu & Bentler, 1998; Schreiber et al., 2006).

Figure 3.4

First-Order Modified Model for Cognitive Instructional Coherence



Note. Modifications included: removal of Items 2 and 7; and correlation of residuals for Items 4 and 5. IPCsch = cognitive coherence items.

Table 3.7

Model Fit Indices

Model	CFI	TLI	RMSEA	SRMR
Original First-Order Model	.96	.95	.12	.03
Modified First-Order Model	.99	.98	.07	.02

Note. Modifications include: Removal of Item 7 and Item 2; Correlation of Error for Items 4 and 5.

Parameter estimates, reported in Figure 3.4, revealed strong significant relationships between each of the indicators and the latent construct Cognitive Instructional Coherence. The

construct accounted for 60 percent of the variance in Item 1 ($\beta = .78$, $p < .01$), 72 percent of the variance in Item 3 ($\beta = .85$, $p < .01$), 76 of the variance in Item 4 ($\beta = .87$, $p < .01$), 67 percent of the variance in Item 5 ($\beta = .82$, $p < .01$), 76 percent of the variance in Item 6 ($\beta = .87$, $p < .01$), and 72 percent of the variance in Item 8 ($\beta = .85$, $p < .01$). All items report strong factor loadings, ranging from .78 to .87, all with significance levels < .01.

Evidence from the factor loadings reported in both of the EFA paired with model fit indices and the strength of the parameter estimates reported in the CFA suggest that structural validity for the Cognitive Instructional Coherence scale was confirmed. The final set of items are presented in Table 3.8.

Table 3.8

Final Items Measuring Cognitive Instructional Coherence

1. In this school, teachers have a shared image in their minds of what learning looks like.
2. In this school, teachers have a shared image in their minds of how to motivate students.
3. In this school, teachers have a shared image in their minds of how to use assessments intentionally to support student growth.
4. In this school, teachers have a shared image in their minds of how to use curriculum to plan purposeful instruction.
5. In this school, teachers have a shared image in their minds about expectations for student learning.
6. In this school, teachers have a shared image in their minds about how to deliver useful feedback to students.

Note. Items were measured using a 6-point Likert scale with a range as follows: Strongly Disagree, Disagree, Somewhat Disagree, Somewhat Agree, Agree, Strongly Agree.

Convergent Validity

Results for the test of convergent validity, presented in Table 3.9, report a strong relationship ($r = .69$, $p<.01$) between cognitive instructional coherence and collective teacher efficacy, confirming the hypothesized relationship. This correlation is slightly stronger than the correlation that structural items ($r = .62$, $p<.01$) have with collective teacher efficacy. Results also show a strong relationship between the cognitive and structural items ($r = .64$, $p<.01$), confirming that these two components are highly correlated but are also measuring distinct phenomena.

Table 3.9

Descriptive Evidence for Convergent Validity Test

Variables	Mean	SD	CogCoh	StrCoh	CTE
CogCoh	4.6	.84	1.0	.64**	.69**
StrCoh	4.3	.95		1.0	.62**
CTE	4.5	.94			1.0

Note. **p<.01. CogCoh = Cognitive Coherence; StrCoh = Structural Coherence; CTE = Collective Teacher Efficacy

Reliability

Descriptive statistics and the Chronbach's alpha value used to evaluate reliability are presented in Table 3.10. Internal consistency of the structural ($\alpha = .925$) scale and cognitive ($\alpha = .947$) scale is excellent with each scale reporting an alpha greater than .90 (Mallery & George, 2003).

Table 3.10

Results for Internal Reliability

	Item Means	Item Mean Min	Item Mean Max	α	Scale Mean	Scale SD	N of Items
Structural Coherence	4.16	3.98	4.35	0.93	25.10	6.23	6
Cognitive Coherence	4.43	4.07	4.56	0.95	35.41	7.24	8

Analysis of Variance Components

Within-group variability and between school variability were calculated to determine whether cognitive instructional coherence is most accounted for at the teacher level or school level. Interclass Correlation Coefficients (ICCs) are presented in Table 3.11. Results show that 89 percent of the variation in cognitive instructional coherence is attributed to teacher-level differences, leaving 11 percent of the variance to be explained by school-level differences. This suggests that in this sample, cognitive instructional coherence has more to do with individual teacher experiences than school membership.

Table 3.11

Variance Components for Cognitive Instructional Coherence

Variable	Variance Within Schools ICC(1)	Variance Between Schools
Cognitive Instructional Coherence	.89	.11

Discussion

The purpose of this study was to 1) build a base of conceptual knowledge around cognitive instructional coherence; 2) advance a scale to measure cognitive instructional coherence in schools; and 3) test the validity of the Cognitive Instructional Coherence scale. The conceptualization of the construct relied on theoretical and conceptual knowledge in the areas of mental models, instructional frameworks, and the sharedness of mental models. These three

bodies of literature provided the basis upon which items were derived. Construct validity of the scale was tested by evaluating three types of validity: content validity, structural validity, and convergent validity. Construct validity was confirmed given that the standards for these tests were met.

The conceptualization, development, and validation of the Cognitive Instructional Coherence scale advances knowledge in the area of Instructional Program Coherence by moving the body of literature into the cognitive realm. All of the empirical evidence on Instructional Program Coherence thus far has been focused on the alignment of the *structural* elements in the instructional environment (Bryk et al., 2010; Newmann et al., 2001; Polikoff, 2012; Wonder-McDowell et al., 2011). While coherence among structural features is crucial, it is limited in its capacity to reach the instructional core unless this alignment is accompanied by coherent mental models among teachers who make the daily decisions within the instructional core. Human behavior is guided not by structural features in one's environment but rather by the cognitive models that not only shape how individuals think and make sense of their environment but also how they act (Ericsson & Pool, 2016; Senge, 2006). To reach teacher behavior in ways that bring coherence to instruction, alignment must extend to the cognitive processes that inform this behavior. This study fills this gap by initiating an emergence of Cognitive Instructional Coherence which seeks to define and measure the sharedness among teacher mental models around the elements of a common instructional framework.

This study conceptualizes Instructional Program Coherence as having two interdependent components – structural and cognitive. This work raises questions about the interplay between these two dimensions, not only in how the dimensions rely on one another but also in how they have distinct roles. Scholars have drawn attention to a similar distinction of types of coherence

within teacher education programs. Some have even used the terms "structural coherence" and "conceptual coherence" in referring to the alignment of teacher education programs (Feinam-Nesmer, 1990; Hammerness, 2006; Tatto, 1996). Tatto (1996) refers to coherence "in terms of shared understandings among faculty and in the manner in which opportunities to learn have been arranged (organizationally, logistically) to achieve a common goal – that of educating professional teachers with the knowledge, skills, and dispositions necessary" (p. 176). This definition brings to light the shared understandings of faculty as well as the structural components that work to align opportunities for learning. In studying teacher education programs, Tatto (1996) learned that teachers developed congruent views of teaching and learning when 1) programs had a coherent set of norms that acted as a framework for learning and discourse; 2) faculty had shared conceptions and beliefs; and 3) program structures were guided by a constructivist approach to learning, allowing teacher candidates to socially construct their beliefs.

This conception of coherence fits well within the discussion of the interdependent nature of structural and cognitive coherence within schools. In teacher education programs, coherent mental models emerge as teachers engage with faculty who have shared conceptions of teaching and learning and as the organizational structures within the program enable teachers to socially construct knowledge and beliefs over time (Tatto, 1996). In the context of coherent schools, it seems that collective sensemaking and construction of meaning, which influence the cognitive component of coherence, are situated *within* coherent organizational structures (i.e., professional development, team collaboration, teacher evaluation). As Wenger (1998) states in reference to communities of scientists, "Knowledge is created, shared, organised, revised, and passed on within and among these communities. In a deep sense, it is by these communities that knowledge

is ‘owned’ in practice” (p. 3). Aligned structures, such as when curriculum, assessments, professional development, and content standards are aligned within a common framework, are provisional to the social and cognitive construction of coherent mental models. As argued in this study, however, coherent structures are insufficient in affecting how teachers approach the teaching and learning environment. Curricular alignment (i.e., alignment of curriculum, content standards, assessments, and professional development) fails to alter instruction unless teachers develop a cognitive representation of how the elements are aligned (Penuel et al., 2009). The common instructional framework, it seems, operates as the bridge that unites the structural and cognitive functions of coherence.

The interdependent relationship of cognitive and structural coherence raises questions about how these dimensions play out in practice. Ideally, a school would have high structural and high cognitive coherence. But what are the implications for a school that has high structural coherence and low cognitive coherence? If there is such a case, this would open questions about why and how this disparity exists. How would these schools differ from those with low structural coherence and high cognitive coherence, if such a case exists? Building a theoretical matrix of these two dimensions would allow researchers and school leaders to identify and understand the implications of each type of coherence. In addition, future research should re-examine with the cognitive coherence measure the empirical relationships that have been previously tested using the structural coherence measure. The previous two studies in this three-part dissertation, for example, could be replicated with the addition of the cognitive items to determine how much additional variance in teacher psychological need satisfaction and teacher intent to leave, if any, can be explained by cognitive coherence.

The Cognitive Instructional Coherence scale has the potential for researchers and school leaders to understand the commonality of mental models of teachers within a school. Still to be explored is the *process* by which cognitive coherence forms within a school context. Specifically, there is need to understand what leadership actions enable the "crafting" of these shared mental models. Alignment does not occur haphazardly (Penuel et al., 2009) but is an ongoing process of sensemaking built around intentional interactions among teachers and leaders (Honig & Hatch, 2004). Identification of specific leadership practices that support this process would allow school leaders to build a climate of "coherence-building" within their schools.

An unexpected finding in this study was the small school-level variance in cognitive instructional coherence. Cognitive instructional coherence was conceptualized as a collective property that reflected shared mental models among teachers within a particular school. One would expect the level of coherence to vary more across schools due to school-level contextual factors. The sample used in this study consisted in majority of large elementary schools. One possible explanation for the low between-school variance is that the size of the organizations limits teacher ability to perceive teacher beliefs and understandings at a macro level. To give an example of one school within the sample, a fourth grade teacher in a school that serves more than 800 K-5th grade students may not even know the kindergarten teacher whose classroom is on the other side of the building. This school has more than 80 faculty and staff members, which could make it difficult to build coherence. Future research could further investigate this finding by measuring cognitive coherence at various levels in the school organization. For example, perhaps coherence is higher among teachers within grade level or subject area teams. In addition, further work could examine whether coherence forms in similar ways among these levels of the school.

In conclusion, many scholars have noted the limited ability of instructional programs and initiatives to alter what occurs in the classroom, specifically how teachers interact with students and with instructional materials (Bruer, 1993; Cohen & Ball, 1999; Darling-Hammond & Bransford, 2007; Newmann et al., 2001). The problem often lies not in the programs themselves but within the limited capacity of schools to coordinate and leverage these programs in ways that improve the instructional core (Newmann et al., 2001). Instructional Program Coherence emerged as a construct to understand and address this problem – how schools bring coherence to the noisy instructional context and work to align these programs toward a common vision of teaching and learning (Newmann et al., 2001; Oxley, 2008; Youngs et al., 2011). As researchers have continued to argue, however, the best and most innovative ideas for improving organizations will fail unless they influence the "pictures of reality" held by those who make day-to-day decisions in the organization (Honig & Hatch, 2004; Leithwood et al., 2004; Schwarz & Gwekwerere, 2007; Senge, 2006). Cognitive Instructional Coherence brings attention to these pictures of reality held by teachers and captures the coherence in how they "see" the teaching and learning environment. Ultimately, if school leaders are able to shape these mental models toward a common vision of teaching and learning, their efforts in organizing instructional programs may result in a more proximal effect on the instructional core.

CONCLUDING DISCUSSION

The purpose of this three-study dissertation was to establish a line of inquiry around the concept Instructional Program Coherence. Previous work in this area has linked instructional program coherence to higher student achievement and school improvement (Bryk et al., 2010; Newmann et al., 2001; Polikoff, 2012; Wonder-McDowell et al., 2011). The process by which coherence brings about positive outcomes in schools has yet to be investigated. Specifically, there is need to understand how coherence in schools works by creating supportive conditions for teachers, the employees responsible for the technical work in the instructional core. Studies in general organizations and large corporations suggest that coherence likely works through employees to accomplish organizational goals by igniting within employees positive psychological states that fuel their work (Alagaraja & Shuck, 2015; Albrecht & Su, 2012; Biggs et al., 2014). Thus, the first study examined the relationship between instructional program coherence and teacher psychological need satisfaction. Findings from this analysis suggest that a coherent instructional environment matters for teacher well-being. It seems that when the instructional environment is coherent, teacher needs for autonomy and relatedness are satisfied, enabling them to thrive in their work environment.

The second study tested the relationship between instructional program coherence and teacher intent to leave the school. It also examined the mediating role of teacher psychological need satisfaction in the relationship between instructional program coherence and teacher intent to leave. Results from these analyses suggest that teachers in coherent schools report lower likelihood of leaving their school. This study also revealed that the relationship between instructional program coherence and teacher intent to leave is largely mediated by the

satisfaction of teacher psychological needs. It seems that a coherent instructional environment ignites within teachers positive psychological states that make them want to stay in their school.

Scholarship around Instructional Program Coherence thus far has relied on Newmann's (2001) definition of the construct, which focuses on the use of a common instructional framework to align structures in the instructional environment (i.e., curriculum, assessments, professional development, teacher evaluation). The alignment of the structural features of schools is an essential component of coherence, but a sole focus on the structural features neglects the role of cognition on human behavior (Honig & Hatch, 2004). If the ultimate goal is to bring coherence directly to the instructional core, influencing the "what" and "how" of teaching and learning, the work of coherence must reach to the places that inform teacher behavior. Mental models hold the assumptions, organized knowledge, and beliefs that drive human behavior (DeChurch & Mesmer-Magnus, 2010; Leithwood et al., 2004; Senge, 2006).

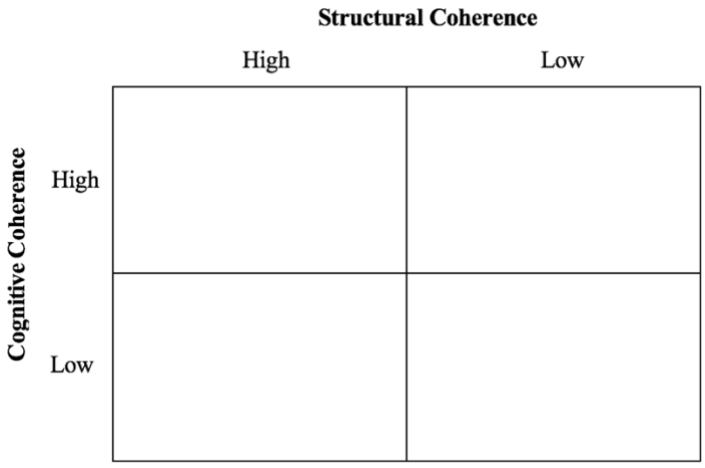
The third study extends the work of instructional program coherence into the cognitive realm, accounting for the sharedness of teacher mental models around the common instructional framework that guides teaching and learning in a particular school. The Cognitive Instructional Coherence scale presents a promising line of research that may capture a dimension of coherence that is more closely situated to the daily decisions that are made in the teaching and learning environment. The measure provides a foundation upon which future research may investigate this dimension, and it raises questions about the nature of cognitive coherence in schools. As previously stated, still yet to be discovered is the process by which cognitive coherence forms. Future work may investigate what leadership practices support the social and cognitive construction of shared mental models among teachers. In addition, it is reasonable to believe that cognitive coherence, being socially constructed and contextually situated, may vary among

levels in the school organization. Perhaps cognitive coherence forms differently at the school level compared to how it forms within grade level or subject area teams. This is a question that could be further investigated using the Cognitive Instructional Coherence scale.

The development of cognitive instructional coherence also raises questions about the interplay between the structural and cognitive dimensions of coherence. It seems that the alignment of structural features may enable the social and cognitive construction of shared mental models, but this link has not yet been tested empirically. Perhaps the investigation of these two dimensions of instructional program coherence could lead to the development of a 2 by 2 matrix similar to the one shown in Figure 3.5. In addition, because the cognitive component of instructional program coherence emerged naturally from this line of inquiry, the first two studies used Newmann's (2001) measure of coherence which captures the structural features. Future work should reexamine these empirical studies with both structural and cognitive coherence. The interdependent nature of these components should be a focus of future research in this area.

Figure 3.5

Potential Instructional Program Coherence Matrix



Surprisingly, the first two studies revealed that teacher competence varied little at the school level. Measures of teacher perceived competence and autonomy were adapted from the Basic Need Satisfaction at Work Scale (Deci et al., 2001). A review of the items revealed that the items measuring competence (Table A5) seem to be more reflective of individual experiences of competence and are not reflective of competence that would be tied to organizational features. For example, one item (reversed) states, "I feel disappointed with my performance in my job." Another item is worded, "At work, I feel capable at what I do." The measure of autonomy (Table A4), on the other hand, seems to capture a perception that is tied to how the school is organized. For example, one item (reversed) states, "I feel pressured to do many things in my job." Another item is worded, "At work, I feel a sense of freedom in the things I undertake." It seems that teacher responses, in this case, would be reflective of some organizational features that would enable the autonomy and volition of teachers. The measure of relatedness, operationalized as organizational commitment, captures a sense of belonging and attachment to the school organization. Further research could consider a measure of competence that is more closely tied to the organization. It also appears that competence among teachers in this sample varied little, even at the individual teacher level. Teachers generally reported high levels of competence, with 64 percent of respondents averaging between a 5 and 6 on a 6-point Likert scale. This low variation in school-level teacher competence should be further explored.

The first two studies also raised questions about the possible covariance between instructional program coherence and faculty trust in principal. In study 1, instructional program coherence absorbed much of the variation that faculty trust in principal had with both autonomy satisfaction and relatedness satisfaction. In study 2, instructional program coherence largely absorbed the variation that faculty trust in principal had with teacher intent to leave. While this

finding should be further explored, one possible explanation for this moderating effect is that as principals work to establish a coherent instructional environment, they simultaneously built a culture of trust. The first two studies employed the structural coherence items which are largely reflective of principal efforts to set up coherent structures (Newmann et al., 2001). It is plausible that teachers are more likely to trust the principal when he or she creates the conditions that enable them in their work. Again, this finding calls for further investigation.

Another surprising finding was that cognitive instructional coherence varied only 11 percent at the school level. Since cognitive coherence is conceived as a construct that is socially constructed among teachers in a school, it seems likely that teacher perceptions would cluster around school membership. Perhaps this low variance is due to the large size of the schools and districts, as previously discussed. This is another finding that yields future exploration.

The measure of both structural coherence and cognitive coherence rely on teacher perceptions. Continued work in this area could investigate the alignment of the existing measures with qualitative observations within schools. In other words, do teacher perceptions of coherence match the actual level of coherence within a school? Although this work is built on the claim that teacher perceptions and interpretations of their environment function as their reality (Penuel et al., 2009; Senge, 2006), testing the coherence of the measures would further test the accuracy of the measure and would also provide insight into how teachers might form their perceptions. For example, there may be factors that cause a teacher to judge the environment as incoherent when, based on observations, the structures seem to be well-aligned in a particular school.

In conclusion, this work has implications for the larger educational crisis of the teaching corps that was discussed as the overarching problem in the introduction of this dissertation. A widespread teacher shortage has characterized the educational landscape on a national scale, and

the gap between supply and demand of teachers continues to widen over time (Sutcher et al., 2016, 2019). While efforts to address the shortage have focused heavily on recruitment of teachers, studies show that the shortage is primarily a result of teachers leaving the profession (Guarino et al., 2006; Ingersoll, 2002, 2003; Oklahoma State Department of Education, 2018). In fact, 90 percent of the demand for teachers in the U.S. is a result of turnover, and the majority of teachers who leave the profession do so for reasons other than retirement (Carver-Thomas & Darling-Hammond, 2017; Oklahoma State Department of Education, 2018).

In Oklahoma, the context for this work, state-level efforts to address the shortage include a historic teacher pay raise, recruitment programs such as Teach For America and Troops to Teachers, and the issuing of thousands of emergency teacher certifications. In 2012, just 32 emergency certifications were granted, as compared to 2019 when nearly 3,000 emergency certifications were issued (Oklahoma State Department of Education, 2019). Interestingly, the two categories of teachers who leave the profession the quickest and at the highest rates in Oklahoma are the two groups of teachers recruited through these efforts – those who enter the profession through external recruitment programs (i.e., Teach For America, Troops to Teachers) and those who receive emergency certifications. (Oklahoma State Department of Education, 2018). These recruitment efforts appear to be widening the gap of the teacher shortage, further disrupting the stability of the teaching corps, as recruited teachers are entering and leaving classrooms through a "revolving door" (Ingersoll, 2003). The problem is not that these recruitment programs are inherently poor but that policy has responded to the wrong issue. The shortage, which is primarily a result of teacher turnover, cannot be solved by simply recruiting more teachers into the profession (Ingersoll, 2002). Ingersoll (2002) likens this problem to a "bucket rapidly losing water because of holes in the bottom" (p. 42). He argues that pouring

more water into the bucket (recruiting more teachers) will not solve the problem unless the holes in the bottom of the bucket are first repaired. These holes in the bucket represent the working conditions in schools (Ingersoll, 2002). While several working conditions have been linked to teacher turnover (Allensworth et al., 2009; Boyd et al., 2011; Carver-Thomas & Darling-Hammond, 2017; Guin, 2004; Ingersoll, 2003; Johnson et al., 2012; Ladd, 2011; Loeb et al., 2005; Smith & Ingersoll, 2004; Weiss, 1999), this work advances this body of knowledge by exploring a working condition that is more closely situated to the daily work of teachers – instructional program coherence.

This work suggests that the instructional environment is an important context that, when intentional aligned, plays an important role in retaining teachers. Further, the pathway through which instructional program coherence seems to influence teacher turnover decisions is through the satisfaction of teacher psychological needs for autonomy and relatedness. While policy addressing the teacher corps crisis has focused on large-scale solutions situated at the state and national levels, the findings from this work suggest that schools may play an important role in supporting the well-being of teachers, ultimately keeping them in their schools. The solution to the large-scale professional crisis may be more contextually situated than previously thought. This should come as good news to school leaders since policy is largely outside of their control. Recruitment efforts in Oklahoma seem to exacerbate the shortage, as evidenced by the high turnover of these recruits (Oklahoma State Department of Education, 2018), as well as weaken the quality of the teacher corps since these recruits have little to no teacher training (Espinoza et al., 2018). Instructional program coherence has the potential to address both of these shortcomings. School leader intentional focus on establishing a common instructional framework that brings coherence to the instructional environment may not only retain teachers but may also

simultaneously strengthen the *quality* of the teaching corps, ultimately improving the quality of instruction. An investment in building coherence is one that may yield returns in multiple areas.

To truly strengthen the quality of what occurs within the teaching and learning context, however, coherence must reach the "deep structures" that act as drivers for the "surface structures," or daily actions, of teachers (Shulman, 2005). This work provides a foundation upon which future scholarship may investigate how cognitive instructional coherence might shape the teaching and learning environment. Returning to the vignette at the beginning of this dissertation, recall the psychological ill-being and frustration that Jen experienced as she perceived the instructional environment in her school as incoherent. Imagine an alternative reality for Jen's story, in which the school leader establishes a clear common instructional framework that is used to align curriculum, assessments, content standards, and pedagogical practices. Jen is able to see how the parts of her job fit together and how instructional materials should be used to plan and deliver meaningful instruction. Professional development topics are sustained from one session to the next and are aligned to the common instructional framework so that Jen has opportunities to build expertise over time and is able to filter, anchor, and organize new knowledge through the existing framework. When her principal conducts evaluation meetings, she ties the feedback to the common framework so that Jen hears clear, consistent messages about what is expected of her rather than receiving isolated bits of information that seem disconnected from the school's instructional focus. Teachers in Jen's school regularly collaborate, and their conversations focus on elements of the instructional framework. This ongoing process builds common language and common goals among faculty which enable them to share ideas more efficiently. External school programs, such as Title I reading programs, are molded so that they fit within the instructional framework of the school. Jen is able to see how these programs serve the school's vision of

teaching and learning, and she is able to treat these programs as an extension of the existing framework.

Building on these aligned structures, Jen and her colleagues engage in an ongoing process of "crafting coherence" (Honig & Hatch, 2004) by which they actively reflect on practice, share their conceptions about teaching and learning, and continually adapt together to new challenges. As a result, they develop shared mental models that are framed by the common instructional framework that guides their work. With a clear mental model of her role, Jen enters the classroom ready to plan and deliver coherent instruction. The clarity of her mental model guides the way she interacts with learning materials, how she "sees" student learning, how she structures learning activities, and how she interacts with students. Because this mental model is shared among colleagues, teacher learning is accelerated, as teachers and leaders in the school are able to build expertise collectively. At the end of the year, Jen is confident in the progress she has made in her first year as an educator, she has built meaningful collegial relationships, and she is excited to return to her school the next year.

The evolution of Jen's actual reality to this alternative account is not out of reach for this school. It would require, however, sustained effort among teachers and leaders to invest in long-term benefits rather than short-term "quick fixes." Coherence is a distant reality for schools that continue to adopt the newest programs and initiatives, or that chase solutions to quickly boost test scores. A journey toward coherence is just that – a j*ourney*. This description implies that there is no definite or final destination, but the benefits of the journey toward coherence are discovered in the process itself (Honig & Hatch, 2004). This type of thinking and leading is largely antithetical to the way that schools currently operate (Bryk, 2015; Cohen & Ball, 1999; Newmann et al., 2001; Oxley, 2008). However, as this work suggests, a shift toward coherence-

building has the potential to support the well-being of teachers and strengthen the stability of the teaching corps. This seems to be a more worthwhile investment than reaching for a collection of disconnected, short-term solutions that only improve school outcomes on a surface level, if at all.

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Appendix

Table A1

Instructional Program Coherence – Structural (IPC)

Item	Likert Scale
1. The programs in this school are implemented carefully.	1 (strongly disagree) to 6 (strongly agree)
2. Once we start a new program, we follow up to make sure that it is working.	1 (strongly disagree) to 6 (strongly agree)
3. The programs in this school are meaningful and effective for our students.	1 (strongly disagree) to 6 (strongly agree)
4. You can see real continuity from one program to another at this school.	1 (strongly disagree) to 6 (strongly agree)
5. Curriculum, instruction, and learning materials are well coordinated across the different grade levels at this school.	1 (strongly disagree) to 6 (strongly agree)
6. There is consistency in curriculum, instruction, and learning materials among teachers in the same grade level at this school.	1 (strongly disagree) to 6 (strongly agree)

Table A2

Faculty Trust in Principal (FTP)

Item	Likert Scale
1. Teachers in this school trust the principal.	1 (strongly disagree) to 6 (strongly agree)
2. The teachers in this school have faith in the integrity of the principal.	1 (strongly disagree) to 6 (strongly agree)
3. The principal in this school typically acts in the best interests of teachers.	1 (strongly disagree) to 6 (strongly agree)
4. Teachers in this school can rely on the principal.	1 (strongly disagree) to 6 (strongly agree)
5. The principal in this school is competent in doing his or her job.	1 (strongly disagree) to 6 (strongly agree)
6. The principal tells teachers what is really going on.	1 (strongly disagree) to 6 (strongly agree)

Table A3

Faculty Trust in Colleagues (FTC)

Item	Likert Scale
1. When teachers in this school tell you something, you can believe them.	1 (strongly disagree) to 6 (strongly agree)
2. Teachers in this school typically look out for each other.	1 (strongly disagree) to 6 (strongly agree)
3. Even in difficult situations, teachers in this school can depend on each other.	1 (strongly disagree) to 6 (strongly agree)
4. Teachers in this school do their jobs well.	1 (strongly disagree) to 6 (strongly agree)
5. Teachers in this school have faith in the integrity of their colleagues.	1 (strongly disagree) to 6 (strongly agree)
6. The teachers in this school are open with each other.	1 (strongly disagree) to 6 (strongly agree)
7. Teachers in this school trust each other.	1 (strongly disagree) to 6 (strongly agree)

Table A4

Autonomy Satisfaction (AS)

Item	Likert Scale
1. I feel my choices in my job express who I really am.	1 (strongly disagree) to 6 (strongly agree)
2. (r) I feel pressured to do many things in my job.	1 (strongly disagree) to 6 (strongly agree)
3. At work, I feel a sense of freedom in the things I undertake.	1 (strongly disagree) to 6 (strongly agree)
4. (r) My daily activities at work feel like a chain of obligations.	1 (strongly disagree) to 6 (strongly agree)

Note. (r) indicates reversed item.

Table A5

Competence Satisfaction (CS)

Item	Likert Scale
1. At work, I feel capable at what I do.	1 (strongly disagree) to 6 (strongly agree)
2. (r) I feel disappointed with my performance in my job.	1 (strongly disagree) to 6 (strongly agree)

3. When I am at work, I feel competent to achieve my goals.	1 (strongly disagree) to 6 (strongly agree)
4. (r) I have serious doubts about whether I can do things well in my job.	1 (strongly disagree) to 6 (strongly agree)

Note. (r) indicates reversed item.

Table A6

Organizational Commitment (OCQ)

Item	Likert Scale
1. I am proud to be part of the staff at this school.	1 (strongly disagree) to 6 (strongly agree)
2. I often describe myself to others by saying that I work at this school.	1 (strongly disagree) to 6 (strongly agree)
3. I am glad I chose to work at this school rather than another school.	1 (strongly disagree) to 6 (strongly agree)
4. I am willing to put in a great deal of effort beyond what is normally expected to help this school succeed.	1 (strongly disagree) to 6 (strongly agree)
5. I have warm feelings about this school as a place to work.	1 (strongly disagree) to 6 (strongly agree)
6. I find that my values and the values of this school are similar.	1 (strongly disagree) to 6 (strongly agree)
7. I feel strong loyalty to this school.	1 (strongly disagree) to 6 (strongly agree)

Table A7

Transformational Leadership Behavior (TLB) Scale

Item	Likert Scale
7. The principal at this school inspires me with his/her plans for the future.	1 (strongly disagree) to 6 (strongly agree)
8. The principal at this school provides a good model for me to follow.	1 (strongly disagree) to 6 (strongly agree)
9. The principal at this school develops a team attitude and spirit among faculty/staff.	1 (strongly disagree) to 6 (strongly agree)
10. The principal at this school insists on only the best performance	1 (strongly disagree) to 6 (strongly agree)
11. The principal at this school behaves in a manner thoughtful of my personal needs.	1 (strongly disagree) to 6 (strongly agree)
12. The principal at this school asks questions that prompt me to think.	1 (strongly disagree) to 6 (strongly agree)
13. The principal at this school commends me when I do a better than average job.	1 (strongly disagree) to 6 (strongly agree)

Table A8

Teacher Intent to Leave (ItL)

Item	Likert Scale
1. How likely is it that you would explore teaching opportunities at other schools?	1 (definitely not) to 6 (definitely)
2. How likely is it that you would leave your school in the next year?	1 (definitely not) to 6 (definitely)
3. How frequently do you think about leaving your school?	1 (never) to 6 (very often)

Table A9

Cognitive Instructional Coherence

Item	Likert Scale
1. Teachers in this school have a shared image in their minds of what learning looks like.	1 (strongly disagree) to 6 (strongly agree)
2. Teachers in this school have a shared image in their minds of what good teaching looks like.	1 (strongly disagree) to 6 (strongly agree)
3. Teachers in this school have a shared image in their minds of how to motivate students.	1 (strongly disagree) to 6 (strongly agree)

4. Teachers in this school have a shared image in their minds of how to use assessment intentionally to support student growth.	1 (strongly disagree) to 6 (strongly agree)
5. Teachers in this school have a shared image in their minds of how to use curriculum to plan purposeful instruction.	1 (strongly disagree) to 6 (strongly agree)
6. Teachers in this school have a shared image in their minds about expectations for student learning.	1 (strongly disagree) to 6 (strongly agree)
7. Teachers in this school have a shared image in their minds of how to address student misbehavior.	1 (strongly disagree) to 6 (strongly agree)
8. Teachers in this school have a shared image in their minds about how to deliver useful feedback to students.	1 (strongly disagree) to 6 (strongly agree)

Table A10

Collective Teacher Efficacy (CTE)

Item	**Likert Scale**
1. Teachers here never give up, even if a child doesn't want to learn.	1 (strongly disagree) to 6 (strongly agree)
2. Teachers here are confident they can motivate their students.	1 (strongly disagree) to 6 (strongly agree)
3. Teachers in this school are able to get through to the most difficult students.	1 (strongly disagree) to 6 (strongly agree)
4. Teachers here have the skills needed to produce meaningful student learning.	1 (strongly disagree) to 6 (strongly agree)
5. Teachers in this school believe that every child can learn.	1 (strongly disagree) to 6 (strongly agree)
6. Teachers in this school have the skills to deal with student disciplinary problems.	1 (strongly disagree) to 6 (strongly agree)
7. Teachers here are able to meet the specific learning needs of each child.	1 (strongly disagree) to 6 (strongly agree)